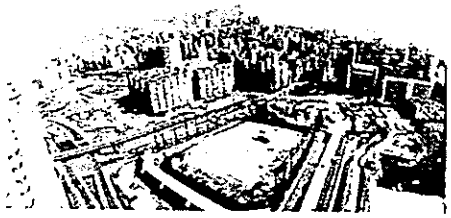
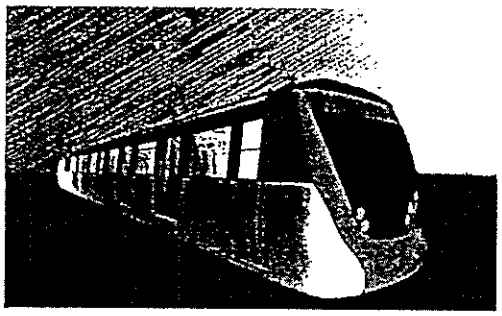
APPENDIX – 10-2

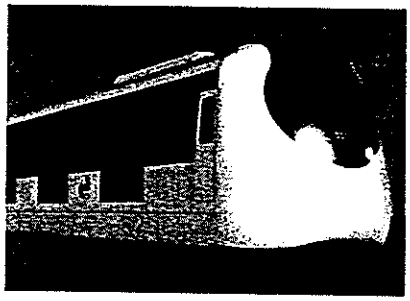
Contamination Assessment Report and Remediation Action Plan

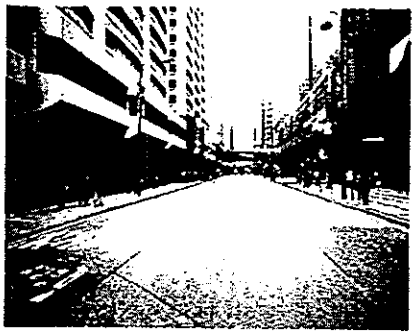
Kowloon-Canton Railway Corporation
New Railway Projects Division

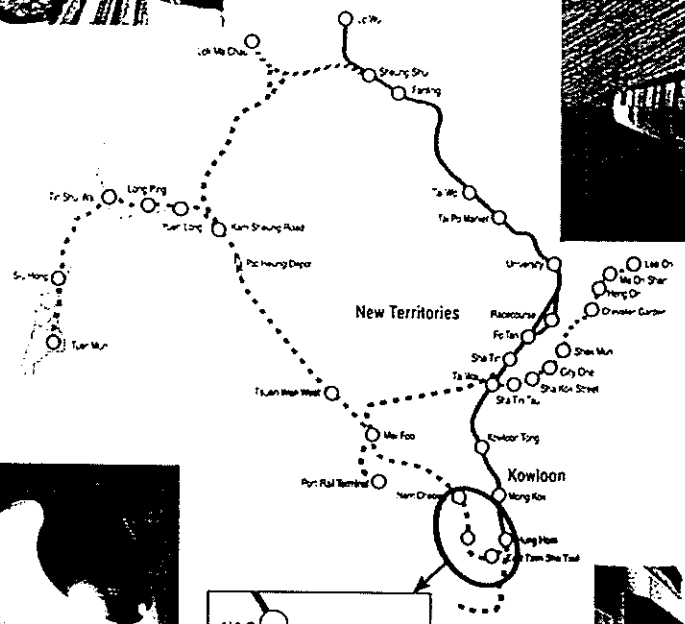
Kowloon Southern Link KSL
Environmental Impact Assessment & Associated Services
Contamination Assessment Report & Remediation Action Plan

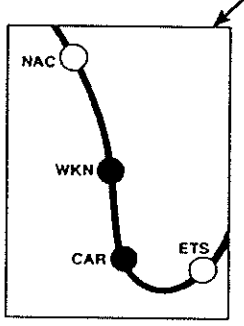












ARUP

Ove Arup & Partners Hong Kong Ltd
in association with
Urbis Ltd
Archaeological Assessment

KCR
九廣鐵路

ARUP

Document Verification

Job title	KSL GSA 5100 Environmental Impact Assessment & Associated Services	Job number	23573
Document title	Contamination Assessment Report & Remediation Action Plan	File reference	
Document ref			

Revision	Date		
1st Issue	25/06/03	Filename	G:\env\project\23573\reports\CAR\23573-CAR2.doc
		Description	Contamination Assessment Report & Remediation Action Plan

	Prepared by	Checked by	Approved by
Name	Thomas Chan	Sam Tsoi	Sam Tsoi
Signature			

2nd Issue	30/10/03	Filename: G:\env\project\23573\reports\CAR\23573-CAR4.doc
		Description: Contamination Assessment Report & Remediation Action Plan

	Prepared by	Checked by	Approved by
Name	Various	Sam Tsoi	Sam Tsoi
Signature			
Filename			
Description			

	Prepared by	Checked by	Approved by
Name			
Signature			
Filename			
Description			

	Prepared by	Checked by	Approved by
Name			
Signature			

Issue Document Verification with Document ☑

CONTENTS

ABBREVIATION

Arup	Ove Arup and Partners Hong Kong Ltd
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CAP	Contamination Assessment Plan
CAR	Contamination Assessment Report
DP	Designated Project
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance
EPD	Environmental Protection Department
ERE	East Rail Extension
ETS	East Tsim Sha Tsui
FMPHQ	Former Marine Police Headquarters
HOKLAS	Hong Kong Laboratory Accreditation Scheme
KSL	Kowloon Southern Link
LAM	Lam Geotechnics Ltd
mbgl	Meter below ground level
NAC	Nam Cheong
PAHs	Polyaromatic Hydrocarbons
PCDD/PCDF	Polychlorinated Dibenzo-p-dioxins and dibenzofurans
PPE	Personal Protective Equipment
PPFS	Preliminary Project Feasibility Study
RAP	Remediation Action Plan
RBSL	Risk-based Screening Level
RfD_o	Chronic Oral Reference Doses
SF_o	Carcinogenic Slope Factor
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxicity Equivalent Unit
KCRC	Kowloon Canton Railway Corporation
TM-EIA	Technical Memorandum on Environmental Impact Assessment Process
TPH	Total Petroleum Hydrocarbon
TST	Tsim Sha Tsui
USEPA	United State Environmental Protection Agency
WKN	West Kowloon
WPCO	Water Pollution Control Ordinance
WR	West Rail

1. INTRODUCTION

1.1 Background

Ove Arup & Partners (Arup) was commissioned by Kowloon Canton Railway Corporation (KCRC) to undertake an Environmental Impact Assessment (EIA) of the proposed Kowloon Southern Link (KSL).

The proposed KSL project is classified as a designated project under Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO). Pursuant to Section 5(7)(a) of the EIAO, EPD issued to KCRC a study brief (ref: EIA Study Brief No: ESB-097/2002 dated March 2002) [1] to carry out an EIA study.

A preliminary assessment of the environmental issues of the proposed project and a study of the pros and cons of the 4 alignment options were provided in a Preliminary Project Feasibility Study of KSL completed in 2001[2 & 3]. Land contamination impact is one of the issues to be addressed in the EIA study. An assessment shall be conducted prior to construction of the KSL alignment to assess any potential land contamination.

Legislation and non-statutory guidance for carrying out land contamination assessment is provided in the following:

- Technical Memorandum on Environmental Impact Assessment Process (TM-EIA) [4];
- ProPECC PN 3/94 – Contaminated Land Assessment and Remediation [5] (hereafter called "ProPECC PN 3/94"); and
- Guidance Notes for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repair/Dismantling Workshops [6] (hereafter called "EPD's Guidance Note").

The Contamination Assessment Plan (CAP) was agreed-in-principle by EPD. Site investigation works were carried out between 29 October 2002 and 28 February 2003 by Lam Geotechnics Ltd (LAM). This Contamination Assessment Report (CAR) and Remediation Action Plan (RAP) summaries the following issues:

- Contamination assessment programme;
- Investigation procedures and methodologies;
- Analytical results of soil and groundwater samples;
- Scope of any remedial work required; and
- The particular health and safety requirement that may be required during the works.

1.2 Alignment Description

KCRC proposes to construct and operate a new railway line with one new railway station as shown in Figure 1 to improve the accessibility to Tsim Sha Tsui (TST) and West Kowloon districts. The proposed 3.7km underground KSL will connect the new KCRC East TST Station to the current West Rail (WR) terminus at Nam Cheong Station, with its alignment running under Salisbury Road, Canton Road and West Kowloon Reclamation area. Upon KSL's completion, the WR train service will terminate at Hung Hom.

1.3 Contaminants of Concern

Site appraisals have identified TST Fire Station, the former shipyard sites within the West Kowloon Reclamation, Canton Road Government Office and Tai Kok Tsui, petrol filling station at the intersection of Kok Cheung Street and Pok Man Street (under Skyway House), and the factory building at Sham Mong Road as potential contamination areas. The types of waste associated with these activities include:

- *Inorganic aqueous wastes*, such as spent acid/alkaline solutions and other solutions with metals (including cadmium, mercury, chromium, and copper), associated mainly with the processes of the printing, publishing and metal industries;
- *Organic liquids and sludges*, such as halogenated and non-halogenated solvents and paint residues involved in the machinery manufacturing trades; and
- *Petroleum (with lead in the past) and oils*, which are commonly used in vehicle and shipyard/dockyard maintenance and petrol filling station.

2. PROCEDURE OF LAND CONTAMINATION ASSESSMENT

2.1 Sampling Time and Locations

Site investigation works were carried out by LAM between 29 October 2002 and 28 February 2003 [7, 8]. Five drillholes were excavated and drilled for soil and groundwater sampling in accordance with the CAP for KSL [9] and agreed on site with KCRC's and the Engineer's supervisory staff. The actual locations are shown in Table 2-1 and Figure 2.

Table 2-1: Sampling locations

Drillhole reference	Proposed drillhole location in CAP		Actual drillhole location		Ground level (mPD)
	Easting (m)	Northing (m)	Easting (m)	Northing (m)	
KSD100/DHEPZ052	835341	818059	835337	818061	4.18
KSD100/DHE056	835293	818131	835290	818136	3.71
KSD100/DH063	835241	818274	835264	818264	3.93
KSD100/DHEPZ113	834521	820078	834518	820085	3.58
KSD100/DH120	834306	820413	834317	820394	12.46

Note:
The drillholes represent the follow locations:
KSD100/DHEPZ052: Tsim Sha Tsui Fire Station
KSD100/DHE056: West Kowloon Reclamation
KSD100/DH063: Ex-government dockyard at Canton Road Government Office
KSD100/DHEPZ113: Petrol filling station under Skyway House and Factory building at Sham Mong Road
KSD100/DH120: Ex-shipyard site in Tai Kok Tsui

In each drillhole except KSD100/DH120, soil samples were obtained at depths of 0.5m, 1.5m, 3.0m and thereafter at approximately 2 to 3m depth intervals. The exact locations and depths for sampling are determined by the on-site Contamination Specialist.

For Drillhole KSD100/DHE120 located at Nam Cheong Park, the top 10-12m depth of fill materials were brought in recently by the West Rail Project after site formation for West Kowloon. Since reclamation, there is no change of landuse and there are no industrial activities carried out within the Park. Potential contamination from the ex-shipyard site in Tai Kok Tsui

should be confined to the marine deposit layer below 10-12m. Hence, soil samples were collected at depths after 12m below ground level.

2.2 Analytical Parameters

All soil and groundwater samples were analysed by a HOKLAS accredited laboratory for the following testing parameters:

- ***Dutch List Metals***, including Arsenic (As), Barium (Ba), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Lead (Pb), Mercury (Hg), Molybdenum (Mo), Nickel (Ni), Tin (Sn) and Zinc (Zn);
- ***Total Cyanide (Total CN);***
- ***Sulphates;***
- ***Total Petroleum Hydrocarbon (TPH)***;
- ***Dioxins*** (for Drillholes KSD100/DH063 & KSD100/DH120 only)
- ***Benzene, Toluene, Ethylbenzene and Xylene (BTEX);*** and
- ***Polyaromatic Hydrocarbons (PAHs).***

3. GROUND CONDITIONS

The ground levels of the site trail from 4.2mPD in the south along Canton Road to 3.6mPD in Tai Kok Tsui and 12.5mPD at Nam Cheong Park. General ground conditions encountered comprises of a top layer of fill materials varying from 11m to 25m thick. The materials encountered during the site investigations consists of fill, fill derive from marine deposit, alluvium, residual soil and decomposed granite. The strata of the drillholes are summarised in Table 3-1 and the site logs are given in Annex 1.

Table 3-1: Summary of drillhole results

Drillhole reference	Ground level (mPD)	Base of Fill (mPD)	Base of Marine Deposit/ Alluvium (mPD)	Base of Decomposed Granite (mPD)	Top of Bedrock (mPD)	Average Groundwater level (mbgl)
		Thickness (m)	Thickness (m)	Thickness (m)		
KSD100/DHEPZ052	4.18	-8.47	-9.32	-19.55	-21.44	2.31
		12.65	0.85	10.23		
KSD100/DHE056	3.71	-1.79	-8.79	-20.29	-20.39	2.69
		5.50	7.00	11.50		
KSD100/DH063	3.93	-10.07	-	-22.34	-22.34	3.23
		14.00	-	12.27		
KSD100/DHEPZ113	3.58	-9.42	-	-42.02	-53.27	2.27
		13.00	-	32.60		
KSD100/DH120	12.46	-12.54	-15.04	-34.16	-34.16	8.24
		25.00	2.50	19.12		

4. ASSESSMENT CRITERIA

4.1 Soils

The results of soil analysis were compared with Dutch "B" Values as given in ProPECC Note PN3/94" as this level had been adopted as the remediation target in most cases in Hong Kong. However, there is no criterion for dioxins and furans (i.e. Polychorinated dibenzo-p-dioxins and dibenzofurans (PCDD/PCDF)). The United State Environmental Protection Agency (USPEA) criterion of 1ppb TEQ (1ng/g, Toxicity Equivalent Unit) is therefore adopted as the assessment criterion. This criterion has been used as the remediation target for residential sites in the USA and in another approved EIA study [10].

4.2 Groundwater

The Dutch ABC Values for groundwater are based on the use of groundwater for potable supply. As this is rarely the case in Hong Kong, the Dutch B Values are not necessarily appropriate for assessing the requirement of groundwater remediation, particularly within urban areas where there may be numerous diffuse sources of historical contamination within the vicinity.

An assessment is therefore based on the Dutch C Value as a screening tool, followed by a risk assessment approach where elevated concentrations of contaminants are present.

5. INTERPRETATION OF RESULTS

5.1 Soil Contamination

A total of 33 soil samples have been collected from 5 drillholes. All the soil samples collected are within the vertical excavation extent for KSL construction. Results indicate that all soil samples are below the Dutch B levels except 1 soil sample collected from KSD100/DH063, of which the lead concentration exceeded the Dutch B level but within the Dutch C level. The analytical results exceeding the Dutch B Levels are given in Table 5-1 and for all soil samples are detailed in Annex 2.

Table 5-1: Summary of soil samples exceeding Dutch B Level

Drillhole reference	Depth	Contaminant	Concentration (mg/kg dry soil)	Dutch B Limit (mg/kg dry soil)	Dutch C Limit (mg/kg dry soil)	Exceedance
KSD100/DH063	1.5m	Lead	220	150	600	> B and < C

The nature and distribution of the contaminated soil samples indicate that contamination is present at discrete hotspot. The finding is supported by the pattern of landuse on this site, which involved ex-dockyard of the Marine Department and typhoon shelter. Analytical results suggest that contamination is not spatially continuous, and is generally limited in depth.

However, it is Government policy that soils containing contaminants in excess of the Dutch B Levels should be remediated. Details of the soil remediation method and the disposal criteria of the contaminated soils are described in Section 6.

5.2 Groundwater Contamination

Groundwater samples were taken from 5 drillholes. Results indicate that 4 groundwater samples exceed the Dutch C. The analytical results exceeding the Dutch C Levels are given in Table 5-2.

Table 5-2: Summary of groundwater samples exceeding Dutch C Level

Drillhole reference	Depth (mbgl)	Contaminant	Concentration (ug/L)	Dutch C Limit (ug/L)
KSD100/DHEPZ052	8.0m	Copper	230	200
		Lead	210	200
KSD100/DHE053(1)	6.5m	Copper	340	200
		Mercury	2.5	2
KSD100/DH063	3.0m	Copper	400	200
KSD100/DHEPZ113	6.5m	Copper	330	200
		Lead	210	200
		Mercury	2.9	2

Notes:

(1) According to the record for Drillhole KSD100/DHE056 (see Figure 2), there is distributed marine deposit starting from approximately 5.5m deep. The on-site Contamination Specialist decided to take soil samples at 0.5, 1 and 3m deep. This drillhole was backfilled after sampling. However, the amount of groundwater collected before backfilling of the borehole was found to be insufficient for the required analytical testings. As such, groundwater was collected at an adjacent Drillhole KSD100/DHE 053 835327m easting and 818111m northing) as determined by the on-site Contamination Specialist.

The groundwater analytical results indicate occasionally elevated concentrations of metals including copper, lead and mercury. Such results are not considered unusual for groundwater in urban areas, where there are numerous potential diffuse sources of contamination. There was no indication of gross contamination of groundwater by organic compounds, and no free product was observed in any of the samples or drillholes. The analytical results for all groundwater samples are detailed in Annex 3.

5.3 Risk-Based Screening Level for Groundwater

Risk-based screening levels (RBSL) for groundwater contaminants exceeding the Dutch C Levels have been calculated using equations given in ASTM E 2081-00: "Standard Guide for Risk-Based Correction Action" (hereafter called "ASTM E 2081-00"). These formulas are used for calculating the ingestion of groundwater. Any of the sampling result also exceeded RBSL, remedial action for groundwater shall be considered.

The construction workers would likely be exposed to groundwater via accidental ingestion. However, the absence of volatile and semi-volatile organic compounds in the groundwater indicate that there is unlikely any risk of exposure via vapour inhalation of groundwater contaminants. As all the underground alignment and station facilities are enclosed in concrete structure, it is not anticipated that future site occupiers will come into contact with groundwater.

5.3.1 RBSL for Non-carcinogens

The RBSL for non-carcinogens is calculated as follows:

$$\mathbf{RBSL}_{\text{(Non-carcinogens in GW)}} = \frac{THQ \times RfD_o \times BW \times AT_n \times 365}{IR \times ED \times EF}$$

Where:

THQ = Target Hazard Quotient for chemical (unitless) = **1**

RfD_o = Chronic Oral Reference dose (mg/kg-day) (chemical specific)

BW = Body Weight (kg) = **60** (conservative assumption for local adult male)

AT_n = Averaging time for non-carcinogens (years) = ED = **5**

IR = Water Ingestion Rate (Litre/d) = **0.02** (average daily water consumption/100)

ED = Exposure Duration (years) = **5** (conservative estimation of duration of construction)

EF = Exposure Frequency (days/year) = **312** (conservative assumption of 6 days/week, for 52 week/year)

5.3.2 RBSL for Carcinogens

The RBSL for carcinogens is calculated as follows:

$$\mathbf{RBSL}_{\text{(Carcinogens in GW)}} = \frac{\text{Risk} \times BW \times AT_c \times 365}{SF_o \times IR \times ED \times EF}$$

Where:

Risk = Target excess individual lifetime cancer risk (Upper range value (TRu) is adopted for worse case assumption) (Unitless) = **0.0004**

BW = Body Weight (kg) = **60** (conservative assumption for local adult male)

ATc = Averaging time for carcinogens (years) = **70**

SFo = Carcinogenic slope factor – oral $(mg/kg\text{-}day)^{-1}$ (carcinogens specific)

IR = Water Ingestion Rate (Litre/d) = **0.02** (average daily water consumption/100)

ED = Exposure Duration (years) = **5** (conservative estimation of duration of construction)

EF = Exposure Frequency (days/year) = **312** (conservative assumption of 6 days/week, for 52 week/year

The actual rate of accidental water ingestion recommended in ASTM E 2081-00 is 2L/day, which is likely to be considerably less in practice than the figure 0.02L (20ml) adopted. Therefore, it is considered that the above parameters are sufficient to give a conservative assessment.

5.3.3 Determination of RBSL

Table 5-1 gives the RBSLs for each contaminant. Specific values for the sources of reference for individual factors are given in Annex 4.

Table 5-1: Risk Based Screening Levels for selected contaminants in groundwater

Contaminants	THQ	Risk	RfD_o	SF_o	BW	AT_n	AT_c	IR	ED	EF	RBSL (mg/L)
Copper	1	--	0.005	--	60	5	--	0.02	5	312	17.5
Lead	--	0.0004	--	0.28	60	--	70	0.02	5	312	70.2
Mercury	1	--	0.0001	--	60	5	--	0.02	5	312	0.351

Since none of the samples exceed the calculated RBSL for the site, remedial action for groundwater is not considered necessary.

6. REMEDIATION ACTION PLAN

6.1 Remediation Objectives

The remediation scheme for the site should:

- Ensure that development of the site does not pose unacceptable risks to human health;
- Safeguard the quality of the wider environment;
- Be achievable within the time constraints of KSL; and
- Be cost-effective.

At the 5 locations, only drillhole KSD100/DH063 is detected to have excessive lead concentration and required to be remediated. The remediation scheme is thus designed solely to clean up the lead contaminant at this drillhole.

6.2 Estimation of Contaminated Soils

The volume of material affected by contamination is calculated by assuming that the material requiring remediation is contained within a 7m diameter of the drillhole location, which has already in contact with the railway alignment. The vertical extent of contamination is reflected from analytical results of the soil samples. Where a sample is identified as contaminated, the depth of contaminated soils is assumed to extend 0.5m above and below the contaminated samples.

The volume of the contaminated materials is therefore estimated in accordance with the above assumption. The affected areas are summarised in Table 6-1 and shown in Figure 3, together with the depth to which contamination is believed to extend, and the volumes of material that requires remediation. From the result, there is no evidence of contamination exceeding the Dutch B Levels in samples taken below the estimated maximum depth of the contaminated soil layer as shown in Table 6-1.

Table 6-1: Estimated volume of soil requiring remediation

Drillhole reference	Depth of layer of contaminated soil (mbgl)	Estimated Volume requiring remediation (m^3)
KSD100/DH063	1.0 – 2.0	39

6.3 Remediation Method

6.3.1 Remedial Options for Metal Contaminated Soils

Metals can be separated or removed but cannot be destroyed. Hence, the techniques available for soil contaminated with metal are therefore generally limited.

For the area of metal contamination, the potential remedial options are "*Solidification/Stabilisation*" or "*Excavation and Landfill Disposal*". It is not considered that

techniques such as "*Soil-Washing*" or "*Physical Separation*" are appropriate to a site where contamination is present in small discrete hotspot. The advantages and disadvantages of each method considered are described in Table 6-2.

Table 6-2: Potential remediation methods for metal contaminated with soils

Methods	Advantages	Disadvantages
Excavation and Landfill Disposal	• Minimal disruption to programme • Low cost • No specialised plant or equipment required • No trials required • No uncertainty regarding treatment effectiveness	• Use of landfill void space • Transport of contaminated material required
Solidification and Stabilisation	• Ensure the contaminants of the disposed material will not be leaked to form contaminated leachate	• Possible need for specialised plant or equipment • Disruption to project programme • Field trials required for establishing performance parameters

Stabilisation/Solidification can be a potentially valuable method in dealing with large volume of contaminated material and hence avoiding use of valuable landfill space. However, it is considered that in the current case the expense and delay necessary to implement this option is not justified considering the volume of material requiring remediation.

6.3.2 Selection of Remediation Method

The remedial options such as bioremediation, soil vapour extraction, soil washing, stabilisation/solidification or other in-situ treatment method may require mobilisation of specialised plant and field trials, which may entail considerable extra cost and delay and may not necessarily be cost-effective where volumes of contaminated material are small.

In accordance with ProPECC PN 3/94, landfill disposal method should be employed only where there is very localised contamination of the site and the quantity of excavated material requiring disposal is small. It is considered that these conditions are satisfied for the KSL assessment as localised hotspot of contamination with dominant of metal contaminant is detected in this site. Therefore, "Excavation and Landfill Disposal" is considered as the most effective remediation method.

Disposal to landfill requires that the material does not exceed the standards for Toxicity Characteristic Leaching Procedure (TCLP) testing as outlined in EPD's Guidance Note. The TCLP testing has been conducted and the testing results are given in Table 6-3. Results indicate that the contaminated soil (i.e. 1.5m of KSL100/DH063) complies with the landfill disposal criteria as given in EPD's Guidance Note, and therefore, the contaminated soil could be disposed of at landfill and no pre-treatment is required. Detailed TCLP testing results are given in Annex 2.

Table 6-3: TCLP testing results for KSD100/DH063 at 1.5m

Parameters	TCLP testing results (ppm)	TCLP limit (ppm)
Cadmium	<1	10
Chromium	<1	50
Copper	<2	250
Nickel	<1.5	250
Lead	12	50
Zinc	<10	250
Mercury	<1	1
Tin	<2	250
Silver	<2	50
Antimony	<2	150
Arsenic	<2.5	50
Beryllium	<1	10
Thallium	<0.08	50
Vanadium	<4	250
Selenium	<1	1
Barium	<2	1000

7. SPECIFICATION FOR REMEDIAL WORKS

7.1 Excavation and Disposal Methodology

Prior to remedial works commencing, the area required remediation should be clearly marked out on site and the surface levels recorded. Excavation of contaminated material should be undertaken using dedicated earth-moving plant that should be thoroughly cleaned (e.g. jet-washed) following completion of excavation works.

An area extending to 3.5m radius from the sample location should be excavated to the depth given in Table 6-1 (i.e. a circular area of 7m diameter centred on the drillhole location). Where the overlaying clean material is uncontaminated, it should be removed and stockpiled adjacent to the excavation until the specified depth is reached.

Excavated contaminated soils should not be stockpiled on site, but should immediately be loaded onto trucks and taken to the chosen landfill site. All trucks carrying contaminated material should be adequately sheet covered to prevent dispersion of contamination on the way to the landfill site.

Although the contaminated soils is situated above the groundwater table, due to the fluctuation of the groundwater table, the remediation contractor should pay attention to the selection of suitable groundwater lowering schemes and discharge points if the contaminated soils is situated below the groundwater table during the excavation. The remediation contractor should also obtain a valid Water Pollution Control Ordinance (WPCO) discharge licence from EPD where applicable.

The remediation contractor should carry out the remediation works in accordance with the procedure set out in Section 7.2 of EPD's Guidance Note and other Ordinance relevant to the works.

The entire remediation programme should be supervised by an on-site Decontamination Specialist (to be appointed by the Contractor), who should have at least 7 years experience in

contamination assessment or decontamination. All relevant method statements prepared by the remediation contractor should be reviewed and approved by the Decontamination Specialist before proceeding with the works.

7.2 Compliance Testing

Following completion of excavation to the specified depth, at least one sample from the base of the excavation and three samples evenly distributed along the boundary of the excavation shall be taken for carrying out the compliance testing. The compliance testing requirements are shown in Table 7-1.

Table 7-1: Requirements for compliance testing

Locations	Testing Requirement	Acceptance Criteria
KSD100/DH063	Lead	Dutch B Level

If the analysis indicates continued presence of contamination, the excavation shall be extended a further 1m depth or wide with material disposed of as described above, and a further sample taken for compliance testing. The process of excavation, sampling and compliance testing should continue until all contaminated material is removed. The excavated hole should then be backfilled by using suitable clean fill material.

7.3 Protective and Safety Measures

The contaminants present on the site are at relatively low levels, and are not expected to pose serious acute health risk to the site workforce. However, it is good practice to ensure that remediation workers are adequately protected to ensure that there are no significant residual risks. The following health and safety precautions are therefore recommended:

- Personal Protective Equipment (PPE) such as safety hat, chemical protective gloves, masks eye goggles, protective clothing (upgraded if contact with contaminated material cannot be avoided) and protective footwear etc. must be provided to staff, which would be involved in the remediation work. No works should be allowed without the suitable PPE.
- Workers should inspect and check their PPE before, during and after use. In cases where any of the PPE is broken, the worker shall stop work immediately and inform the on-site registered safety officer. The worker is not allowed to re-start his work until the broken PPE is replaced.
- Hand washing basins or other washing facilities shall be provided in areas easily accessible to all workers.
- Workers should always maintain basic hygiene standard (e.g. hand wash before leaving the contaminated work zone). Workers shall also be responsible for cleaning and storing their own PPE in a secure place before leaving the site.
- Eating, drinking and smoking must be strictly prohibited within the site areas.

It should be noted that these precautions are additional to any other health and safety requirements that will apply on the site such as those requiring protective footwear and headgear.

8. REFERENCES

[1] Environmental Impact Assessment Study Brief No. ESB-097/2002 dated March 2002, issued by EPD
[2] KCRC Final Environmental Impact Assessment Report (Updated) – Kowloon Southern Link KSL-100 Preliminary Project Feasibility Study and Project Proposal dated July 2001
[3] KCRC Final PPFS Report – Volume 2A – Text (Updated) Kowloon Southern Link KSL-100 Preliminary Project Feasibility Study and Project Proposal dated July 2001
[4] Technical Memorandum on Environmental Impact Assessment Process (EIA Ordinance) (TM-EIA), (1997), published by EPD
[5] Contaminated Land Assessment and Remediation, ProPECC PN 3/94, (1994), published by EPD
[6] Guidance Notes for the Investigation and Remediation of Contaminated Sites of: Petrol Filling Stations, Boatyards, and Car Repair/Dismantling Workshops, (1999), published by EPD
[7] Draft Environmental Field Work Report - KCRC Contract No.KAW820 Ground Investigation Works (Stage 1) of KSL dated 24 December 2002 by Lam Geotechnics Ltd
[8] Final Land Contamination Report (Draft) - KCRC Contract No.KAW820 Ground Investigation Works (Stage 1) of KSL dated 24 December 2002 by Lam Geotechnics Ltd
[9] Contamination Assessment Plan - KCRC GSA5100 Environmental Impact Assessment & Associated Services dated February 2003
[10] Agreement No. CE 15/99 Environmental Impact Assessment for Demolition of Kwai Chung Incineration Plant (Final Report), CED Dated September 2001

ANNEX 1

LOG RECORDS OF DRILLHOLES

DRILLHOLE RECORD

HOLE No.	KSD100/DHE053
SHEET	1 of 4

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 835326.75 N 818110.62	CONTRACT No. KAW820
MACHINE & No. CS-6		DATE from 14/11/02 to 18/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 4.29 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
14/11/2002	Sw								4.19	0.10			Grey (5/) CONCRETE
								1		0.50			Brown (7.5 YR 4/4) mottled black, slightly clayey slightly silty fine to coarse SAND with some angular fine to coarse gravel sized moderately strong to strong rock fragments (FILL)
1								INSPECTION PIT 2		1.00			
								3	2.79	1.50			
2								4	2.29	2.00			Soft, reddish brown (5 YR 5/4), silty sandy CLAY with occasional angular fine to medium gravel sized quartz and rock fragments (FILL)
								5		2.50			Loose, light brown (7.5 YR 6/4) and light reddish brown (7.5 YR 7/6) mottled black, clayey silty fine to coarse SAND with some angular fine to medium gravel sized quartz and rock fragments (FILL)
	Sw 3.00 Pw		88				15bls	6 7 8		3.00			
3										3.45			
							(1,1, 1,2,2,3) N=8	9		4.00			
4								10		4.45			
									-0.71	5.00			
			80				44bls	11 12		5.14			Soft, dark grey (7.5 YR 4/1) mottled black spotted white, slightly sandy silty CLAY with occasional angular to subangular fine gravel sized quartz fragments and occasional shell fragments (FILL-derived from Marine Deposit)
5										5.45			
									-1.71	6.00			
							(2,2, 2,2,2,3) N=9	13					Loose, reddish brown (7.5 YR 7/6), slightly clayey slightly silty fine to coarse SAND with some angular to subangular fine gravel sized quartz fragments (FILL)
								14		6.45			
6										7.00			
			50				35bls	15 16		7.45			
7										8.00			
							(2,2, 1,1,2,3) N=7	17		8.45			
8								18		9.00			
			55				61bls	19		9.45			
9								20		10.00			
10													

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U76 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 19/11/2002
CHECKED I.S.McGlen
DATE 22/11/2002

REMARKS
1. Inspection pit excavated to 3.00m depth.
2. Acoustic televiewer carried out at 28.50-33.62m depth.
3. Water sample carried out at 5.14m depth when the drillhole was at 5.14m depth.
4. Standpipe installed to 24.50m.
5. Temperature Monitoring carried out at 24.50m depth.

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel: 2882 - 3939 ·Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No. KSD100/DHE053

SHEET 2 of 4

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 835326.75 N 818110.62	CONTRACT No. KAW820
MACHINE & No. CS-6		DATE from 14/11/02 to 18/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 4.29 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
							(2,3, 3,4,4,6) N=17	21		10.45			10.00-11.00m: medium dense
11			88				39blS	22					
								23	-6.71	11.00			Light grey (7.5 YR 7/1) mottled yellow, clayey silty fine to coarse SAND with occasional angular to subangular fine gravel sized quartz fragments (ALLUVIUM)
12								24		11.45			
							(1,2, 3,5,7,10) N=25	25	-7.71	12.00			Firm, light grey (7.5 YR 7/1) mottled yellow, slightly sandy clayey SILT with occasional angular to subangular fine gravel sized quartz fragments (ALLUVIUM)
13			100					26		12.45			
								27	-8.71	13.00		V	Extremely weak, reddish brown, completely decomposed medium grained GRANITE (Stiff, slightly sandy clayey SILT with occasional fine gravel sized quartz fragments)
14								28	-9.81	14.00 14.10			
							(2,2, 4,4,5,9) N=22	29		14.55		V	Extremely weak, red mottled white and brownish grey, completely decomposed medium grained GRANITE (Stiff, slightly sandy SILT/CLAY with occasional fine gravel sized quartz fragments)
15			70					30	-10.71	15.00			
								31				V	Extremely weak, yellowish brown mottled white and black, completely decomposed medium grained GRANITE (Slightly clayey silty fine to coarse SAND with some fine to medium gravel sized quartz and granite fragments)
16		3.05m 18:00						32	-11.81	16.00 16.10			
		2.40m 08:00					(2,3, 4,6,8,10) N=28	33		16.55		V	Extremely weak, brown mottled white and black, completely decomposed medium grained GRANITE (Stiff, clayey sandy SILT with occasional fine gravel sized quartz fragments)
17	15/11/2002 Pw 16.55 Hw		100					34		17.00			
								35					
18								36		18.00			
							(3,5, 8,8, 11,16) N=43	37		18.10			
								38		18.55			
19			100					39	-14.71	19.00		V/IV	Extremely weak to weak, yellowish brown mottled white and black, completely to highly decomposed medium grained GRANITE (Slightly clayey slightly silty sandy fine to coarse GRAVEL sized weak rock fragments)
20										20.00			

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U76 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 19/11/2002
CHECKED I.S.McGlen
DATE 22/11/2002

REMARKS

Lam Geotechnics Limited
Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6, Sun Yip St., Chaiwan, Hong Kong.
Tel: 2882 - 3539 Fax: 2882 - 3331

DRILLHOLE RECORD

HOLE No.	KSD100/DHE053
SHEET	3 of 4

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 835326.75 N 818110.62	CONTRACT No. KAW820
MACHINE & No. CS-6		DATE from 14/11/02 to 18/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 4.29 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
							(7,11, 16,22, 27,37) N=102	40 41 42	-15.81	20.10		V	As sheet 2 of 4
										20.55			Extremely weak, brown mottled white, black and pink, completely decomposed medium grained GRANITE (Slightly clayey silty fine to coarse SAND with occasional fine gravel sized quartz fragments)
21			100					43		21.00			
22							(5,10, 11,19, 27,40) N=97	44 45 46		22.00 22.10 22.55			
23			86					47		23.00			
24							(6,14, 23,26, 29,60) N=138	48 49 50		24.00 24.10 24.55			24.00-24.10m: slightly clayey slightly silty SAND with some angular fine to medium gravel sized quartz and rock fragments
25			0						-20.71	25.00			
		3.45m 18:00						51		25.70 25.80		V/IV	Extremely weak to weak, brown mottled black and pink, completely to highly decomposed medium grained GRANITE (Slightly silty sandy fine to coarse GRAVEL sized quartz and weak rock fragments)
26		2.30m 08:00	96	78	48	8.7			-21.53	25.82			
16/11/2002			93					52	-21.76	26.05		II	Strong, pinkish grey spotted black, slightly decomposed medium grained GRANITE with closely spaced, rough undulating, limonite stained joints, dipping at 65°-75° (CORESTONE)
										26.10 26.80 26.90		V/IV	
27							50/40mm, 100/50mm 100blS/50mm	53 54	-22.76	26.99 27.05			Extremely weak to weak, brown mottled black, completely to highly decomposed medium grained GRANITE (Slightly silty sandy fine to coarse GRAVEL sized quartz and weak rock fragments)
			100	94	78	13.9			-23.12	27.41		II	
			100	59	59	>20			-23.17	27.46		V/IV	
						8.3			-23.39	27.68		III	
28			96	92	92	12.0			-23.61	27.90		III/II	Strong, red mottled white and black, slightly decomposed medium grained GRANITE with closely, occasionally very closely spaced, rough planar and undulating, limonite and manganese oxide stained joints, dipping at 0°-10° (CORESTONE)
			0						-23.86	28.15 28.28		V/IV	
							50/20mm, 100/30mm 100blS/30mm	55 56	-24.11	28.30		II IV	
										28.45		V/IV	
29			95	73	73	NI			-24.59	28.88		III	27.41-27.46m: no recovery inferred to be completely to highly decomposed GRANITE
						3.0				29.43			Moderately strong to strong, reddish brown mottled black, moderately to slightly decomposed, medium grained GRANITE with very closely to closely spaced, rough undulating, limonite and manganese oxide
			100	100	90								
30													

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U76 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 19/11/2002
CHECKED I.S.McGlen
DATE 22/11/2002

REMARKS

Lam Geotechnics Limited
Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
Tel 2882 - 3939 Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No.	KSD100/DHE053
SHEET	4 of 4

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 835326.75 N 818110.62	CONTRACT No. KAW820
MACHINE & No. CS-6		DATE from 14/11/02 to 18/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 4.29 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
18/11/2002	Hw 32.46	3.55m 08:00	99	95	95	8.9 1.8 13.3 0.8				30.90			stained joints, dipping at 0°-10° (CORESTONE) 27.46-27.55m: moderately weak, brown, moderately decomposed 27.68-27.90m: no recovery inferred to be completely to highly decomposed GRANITE Strong, pinkish red spotted white and black, slightly decomposed medium grained GRANITE with closely spaced, rough undulating, limonite and manganese oxide stained joints, dipping at 0°-10° and 70°-80° (CORESTONE) 28.15-28.40m: weak, brown mottled white and black, highly decomposed medium grained GRANITE (Fine to coarse GRAVEL with occasional cobble sized weak to moderately weak rock fragments) 28.40-28.88m: no recovery inferred to be completely to highly decomposed GRANITE
			100	100	100					32.46			Strong, pinkish red and pinkish grey spotted white and black, slightly decomposed medium grained GRANITE with medium to widely, occasionally closely spaced, rough and smooth planar, limonite and manganese oxide stained, chlorite coated, kaolin (<1mm) infilled joints, dipping at 45°-55° and 60°-70° 28.88-30.90m: medium to coarse grained granite
		2.45m 18:00	100	100	100				-29.78	33.56 34.07			End of investigation hole at 34.07m

SMALL DISTURBED SAMPLE	STANDARD PENETRATION TEST
PISTON SAMPLE	IN-SITU VANE SHEAR TEST
U76 UNDISTURBED SAMPLE	PERMEABILITY TEST
U100 UNDISTURBED SAMPLE	IMPRESSION PACKER TEST
MAZIER SAMPLE	PACKER TEST
SPT LINER SAMPLE	PIEZOMETER TIP
WATER SAMPLE	OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 19/11/2002
CHECKED I.S.McGlen
DATE 22/11/2002

REMARKS

Lam Geotechnics Limited
Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
Tel 2882 - 3939 Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No.	KSD100/DHE056
SHEET	1 of 3

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 835290.49 N 818136.29	CONTRACT No. KAW820
MACHINE & No. CS-6		DATE from 08/11/02 to 12/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 3.71 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
08/11/2002	Sw							INSPECTION PIT	3.61	0.10			Grey CONCRETE
										0.50			Reddish brown (2.5 YR 5/4), clayey very silty fine to coarse SAND with some angular fine to medium gravel sized quartz and rock fragments (FILL)
										1.00			
										1.50			
										2.00			
									1.21	2.50			
			0				19blows		0.71	3.00			Soft, reddish brown (2.5 YR 5/4), slightly sandy silty CLAY with occasional angular to subangular fine to medium gravel sized quartz and rock fragments (FILL)
							(2,2, 1,1,1,2) N=5			3.50			Loose, brown (7.5 YR 4/4), slightly clayey silty fine to coarse SAND with occasional angular fine to medium gravel sized quartz and rock fragments (FILL)
			0				40blows		-0.29	3.95 4.00			Brown (7.5 YR 4/4) mottled white, slightly silty sandy angular to subangular fine to medium GRAVEL sized quartz and rock fragments (FILL)
							22blows		-0.79	4.50			
		3.05m 18:00	33				23blows		-1.29	5.00			Firm, brown (7.5 YR 4/4), slightly sandy silty CLAY with occasional angular to subangular fine gravel sized quartz and rock fragments (FILL)
09/11/2002		2.40m 08:00	73						-1.79	5.50			
	Sw 6.00 Pw						(3,2, 1,2,2,3) N=8			5.80			Dark grey (4/) mottled black, slightly clayey slightly silty fine to coarse SAND with some angular fine to coarse gravel sized quartz and moderately weak to moderately strong rock fragments (FILL)
			38				29blows		-2.29	6.00			
							38blows		-2.79	6.50			Soft, dark brown (7.5 YR 3/2), slightly silty slightly sandy CLAY with occasional angular to subangular fine gravel sized quartz and rock fragments and occasional shell fragments (DISTURBED MARINE DEPOSIT?)
			0						-3.29	7.00			
			40				48blows			7.50			Dark grey (4/) mottled white, clayey silty fine to medium SAND with occasional angular fine gravel sized quartz and rock fragments and some shell fragments (DISTURBED MARINE DEPOSIT?)
							(3,3, 3,4,4,7) N=18			7.95			
			0				63blows		-4.29	8.00			Dark grey (4/) mottled white, slightly sandy angular fine to coarse GRAVEL sized strong granite and asphalt fragments with many shell fragments (DISTURBED MARINE DEPOSIT?)
			50				49blows						
			65				66blows			9.00			Medium dense, grey (5/) and brown (7.5 YR 4/4), slightly clayey slightly silty fine to coarse SAND with occasional angular to subangular fine gravel sized quartz fragments (DISTURBED MARINE DEPOSIT?)
							(4,3, 3,3,7,17) N=30			9.50			
										9.95 10.00			Dense, light yellowish brown (10 YR 6/4).

- SMALL DISTURBED SAMPLE
- PISTON SAMPLE
- U76 UNDISTURBED SAMPLE
- U100 UNDISTURBED SAMPLE
- MAZIER SAMPLE
- SPT LINER SAMPLE
- WATER SAMPLE
- STANDARD PENETRATION TEST
- IN-SITU VANE SHEAR TEST
- PERMEABILITY TEST
- IMPRESSION PACKER TEST
- PACKER TEST
- PIEZOMETER TIP
- OBSERVATION WELL TIP

LOGGED C.M.Ting

DATE 16/11/2002

CHECKED I.S.McGlen

DATE 18/11/2002

REMARKS

1. Inspection pit excavated to 3.00m depth.
2. Water sample carried out at 5.80m depth when the drillhole was at 29.69m depth.

Lam Geotechnics Limited

·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6, Sun Yip St., Chaiwan, Hong Kong.
·Tel: 2882 - 3939 ·Fax: 2882 - 3331

DRILLHOLE RECORD

HOLE No.	KSD100/DHE056
SHEET	2 of 3

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 835290.49 N 818136.29	CONTRACT No. KAW820
MACHINE & No. CS-6		DATE from 08/11/02 to 12/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 3.71 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
11			45				102bls	30					slightly clayey slightly silty fine to coarse SAND with some angular to subangular fine gravel sized quartz fragments (DISTURBED MARINE DEPOSIT?) 10.50 - 10.95m: some shell fragments.
			63				89bls	31 32		10.50			
							(2,3, 2,4,5,8) N=19	33	-7.29	11.00			
12		3.20m 18:00	83				87bls	34 35 36		11.45 11.50			Medium dense, grey (6/) and light reddish brown (2.5 YR 6/4) mottled yellow, slightly clayey slightly silty fine to coarse SAND with occasional subangular to subrounded fine gravel sized quartz fragments (ALLUVIUM)
	11/11/2002	2.10m 08:00	90				32bls	37	-8.29	12.00			
							(2,2, 3,3,4,6) N=16	38 39	-8.79	12.50			Soft to firm, light grey (7/) mottled yellow, slightly sandy clayey SILT (ALLUVIUM)
13			100					40 41 42		12.95 13.00		V	Extremely weak, red and reddish brown mottled white, completely decomposed medium grained GRANITE (Firm to stiff, slightly sandy silty CLAY with occasional fine gravel sized quartz fragments)
14							(4,4, 4,7,9,13) N=33	43 44 45		14.00 14.10 14.55			
15			100					46		15.00			
16							(2,7, 11,12, 13,14) N=50	47 48 49		16.00 16.10 16.55			
17			100					50	-13.29	17.00		V	Extremely weak, brown and yellowish brown mottled white and black, completely decomposed medium grained GRANITE (Slightly clayey silty fine to coarse SAND with occasional fine gravel sized quartz fragments)
18							(4,8, 13,16, 20,26) N=75	51 52 53		18.00 18.10 18.55			
19			100					54		19.00			
20										20.00			

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U75 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 16/11/2002
CHECKED I.S.McGlen
DATE 18/11/2002

REMARKS

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel: 2882 - 3939 ·Fax: 2882 - 3331

DRILLHOLE RECORD

HOLE No.	KSD100/DHE056
SHEET	3 of 3

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 835290.49 N 818136.29	CONTRACT No. KAW820
MACHINE & No. CS-6		DATE from 08/11/02 to 12/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 3.71 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
							(4,10, 21,31, 55,80) N=187	55 56 57		20.10 20.55			As sheet 2 of 3
21	Pw 21.00 Hw		100					58	-17.29	21.00		V/IV	Extremely weak to very weak, yellowish brown and brown mottled white and black, completely to highly decomposed medium grained GRANITE (Slightly clayey slightly silty fine to coarse SAND with some fine to medium gravel sized granite fragments)
22		3.30m 18:00								22.00 22.10 22.25			
23 12/11/2002		2.10m 08:00	100				15, 40/40mm, 100/35mm 100blS/35mm	59 60 61 62		23.00			
24	Hw 24.00		98	81	80	NI 10.0 0	50/40mm, 100/35mm 100blS/35mm	63 64	-20.29	23.70 23.80 23.88 24.00			
									-20.39	24.10		IV/III III/II	Strong, pinkish grey spotted white and black, slightly decomposed medium grained GRANITE with closely to widely, occasionally very closely spaced, rough planar and undulating, limonite stained, kaolin (<1mm) infilled joints, dipping at 0°-10° and 70°-80°
25			100	95	95	20.0 5.3				25.22		II	24.00-24.10m: weak to moderately weak, brown, highly to moderately decomposed (Coarse GRAVEL and occasional cobble sized weak to moderately weak rock fragments)
26						0							24.10-25.10m: moderately strong to strong, pink, moderately to slightly decomposed
27			100	100	100	7.5 0.7				26.72			26.60-26.72m: occasional dissolution features
28			100	100	100	0				27.90			27.85-28.25m: subvertical
29		3.20m 18:00	100	100	100					28.73			
30									-25.98	29.69			End of investigation hole at 29.69m

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U75 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 16/11/2002
CHECKED I.S.McGlen
DATE 18/11/2002

REMARKS

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6, Sun Yip St., Chaiwan, Hong Kong.
·Tel 2882 - 3939 ·Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No.	KSD100/DHE063
SHEET	1 of 4

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 835264.04 N 818263.73	CONTRACT No. KAW820
MACHINE & No. CS-6		DATE from 25/11/02 to 28/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 3.93 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
25/11/2002	Sw							INSPECTION PIT		0.50			Red (2.5 YR 4/6) and brown (7.5 YR 4/4), slightly clayey silty fine to coarse SAND with some angular fine gravel sized quartz and rock fragments (FILL)
										1.00			
										1.50			
										2.00			
										2.50			
			58				16bls			3.00			
										3.50			
									-0.07	4.00			
			49				(3,23, 27,16, 8,15) N=66 83bls			4.45			Very dense, reddish yellow (7.5 YR 6/6) mottled black, slightly clayey slightly silty fine to coarse SAND with some angular fine to medium gravel sized quartz and rock fragments (FILL)
										4.50			
			44				42bls		-1.07	5.00			
										5.50			Firm, reddish yellow (7.5 YR 6/6) mottled black, clayey sandy SILT with occasional angular fine gravel sized quartz and rock fragments (FILL)
	Sw 6.00 Pw		73					P	-1.92	5.85			
		4.80m 18:00							-2.37	6.30			Pinkish grey (7.5 YR 7/2) mottled black and brown, angular COBBLE and BOULDER sized moderately strong to strong granite fragments (FILL)
26/11/2002		2.30m 08:00	89				17bls			6.50			Loose, dark grey (N4/) mottled brown spotted white, clayey silty fine to coarse SAND with some angular to subrounded fine to coarse gravel sized quartz and moderately strong rock fragments and occasional shell fragments (FILL-derived from Marine Deposit)
			80				22bls			7.00			
										7.50			
										8.00			
							(1,1, 1,2,2,4) N=9			8.45			
			40				48bls			8.50			
										9.00			
			40				66bls			9.50			
									-6.07	10.00			

- SMALL DISTURBED SAMPLE
- PISTON SAMPLE
- U76 UNDISTURBED SAMPLE
- U100 UNDISTURBED SAMPLE
- MAZIER SAMPLE
- SPT LINER SAMPLE
- WATER SAMPLE
- STANDARD PENETRATION TEST
- IN-SITU VANE SHEAR TEST
- PERMEABILITY TEST
- IMPRESSION PACKER TEST
- PACKER TEST
- PIEZOMETER TIP
- OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 03/12/2002
CHECKED I.S.McGlen
DATE 04/12/2002

REMARKS
1. Inspection pit excavated to 3.00m depth.
2. Water sample carried out at 3.00m depth when the drillhole at 3.00m depth.

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel: 2882 - 3939 ·Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No. KSD100/DHE063

SHEET 2 of 4

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 835264.04 N 818263.73	CONTRACT No. KAW820
MACHINE & No. CS-6		DATE from 25/11/02 to 28/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 3.93 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
11			40				(7,7, 2,4, 10,24) N=40 81blS	25 26 27		10.45 10.50			Dense, grey (N5/) and brown (7.5 YR 5/3) mottled white, fine to coarse SAND with some angular to subangular fine gravel sized quartz fragments and some shell fragments (FILL)
			44				48blS	28 29 30		11.00 11.50			
12							(3,6, 6,4,4,7) N=21	31	-8.07	12.00			
			78				71blS	32 33	-8.57	12.45 12.50			Soft, black (7.5 YR 2.5/1) spotted white, silty sandy CLAY with occasional angular to subangular fine gravel sized quartz fragments and occasional shell fragments (FILL)
13			69				42blS	34 35	-9.07	13.00			Grey (7.5 YR 5/1) spotted white, fine to coarse SAND with occasional angular to subangular fine gravel sized quartz fragments and occasional shell fragments (FILL)
								36		13.50			
14							(2,5, 4,4,6,9) N=23	37	-10.07	14.00			Firm, strong brown (7.5 YR 5/6) mottled white and brown, silty clayey fine to coarse SAND with occasional angular fine gravel sized quartz fragments (FILL)
			82				71blS	38 39		14.45 14.50		V	Extremely weak, red and yellowish red mottled white and black, completely decomposed medium grained GRANITE (Stiff, slightly sandy silty CLAY with occasional fine gravel sized quartz fragments)
15		3.50m 18:00						40	-11.07	15.00			
16	27/11/2002	2.30m 08:00	100				(5,7, 10,13, 17,22) N=62	41 42 43 44		16.00 16.10 16.55		V	Extremely weak, red and brown mottled white and black, completely decomposed medium grained GRANITE (Clayey silty fine to coarse SAND with occasional fine gravel sized quartz and granite fragments)
17			100					45		17.00			
18							(6,10, 11,13, 18,23) N=65	46 47 48		18.00 18.10 18.55			
19			30					49		19.00			
20										20.00			

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U76 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 03/12/2002
CHECKED I.S.McGlen
DATE 04/12/2002

REMARKS

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel 2882 - 3939 ·Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No.	KSD100/DHE063
SHEET	3 of 4

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 835264.04 N 818263.73	CONTRACT No. KAW820
MACHINE & No. CS-6		DATE from 25/11/02 to 28/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 3.93 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
									-16.17	20.10		V	As sheet 2 of 4 Extremely weak, brown and pink, completely decomposed medium grained GRANITE (Stiff, clayey sandy SILT with occasional fine gravel sized quartz fragments)
21			100				(4,5, 12,16, 21,25) N=74	50 51 52 53		20.55 21.00			
22	Pw 22.00 Hw						(4,6, 10,11, 15,20) N=56	54 55 56		22.00 22.10 22.55			
23			88					57	-19.07	23.00		V	Extremely weak, pink mottled white and brown, completely decomposed medium grained GRANITE (Clayey silty fine to coarse SAND with some fine gravel sized quartz and granite fragments)
24							(7.8, 10,13, 17,22) N=62	58 59 60		24.00 24.10 24.55			
25			90					61	-21.07	25.00		V/IV	Extremely weak to weak, brown mottled white, completely to highly decomposed medium grained GRANITE (Sandy fine to coarse GRAVEL sized weak rock fragments)
26	Hw 26.27						50/30mm, 100/30mm 100blS/30mm	62 63	-22.34	26.00 26.10 26.16 26.27			
		3.70m 18:00	100	77	72	>20 5.5						II/I	Strong to very strong, pinkish grey spotted white and black, slightly decomposed to fresh medium grained GRANITE with medium to widely, occasionally very closely, closely and very widely spaced, rough planar, limonite stained, chlorite coated joints, dipping at 0°-10° and 60°-70° 26.27-26.80m: red coarse grained granite 26.80-27.00m: fine grained granite 27.00-27.15m: a quartz vein (<100mm thick, dip 70°) 27.15-27.35m: fine grained granite 27.35-27.80m: strong and slightly decomposed 27.80-29.05m: medium to coarse grained granite
27		2.80m 08:00	100	100	95	1.7				26.87			
28	28/11/2002		100	100	100	20.0 2.9				27.80		II	
29						0						II/I	
			100	100	100					29.34			
30													

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U76 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 03/12/2002
CHECKED I.S.McGlen
DATE 04/12/2002

REMARKS

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 25/F., Unit 3, Honour Ind. Centre, No. 6, Sun Yip St., Chaiwan, Hong Kong.
·Tel 2882 - 3939 ·Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No. KSD100/DHE063

SHEET 4 of 4

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 835264.04 N 818263.73	CONTRACT No. KAW820
MACHINE & No. CS-6		DATE from 25/11/02 to 28/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 3.93 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
31			100	100	100	8.0 0				30.89			As sheet 3 of 4
									-27.78	31.71			End of investigation hole at 31.71m
32													
33													
34													
35													
36													
37													
38													
39													
40													

- SMALL DISTURBED SAMPLE
- PISTON SAMPLE
- U76 UNDISTURBED SAMPLE
- U100 UNDISTURBED SAMPLE
- MAZIER SAMPLE
- SPT LINER SAMPLE
- WATER SAMPLE
- STANDARD PENETRATION TEST
- IN-SITU VANE SHEAR TEST
- PERMEABILITY TEST
- IMPRESSION PACKER TEST
- PACKER TEST
- PIEZOMETER TIP
- OBSERVATION WELL TIP

LOGGED C.M.Ting

DATE 03/12/2002

CHECKED I.S.McGlen

DATE 04/12/2002

REMARKS

Lam Geotechnics Limited

·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel: 2882 - 3939 ·Fax: 2882 - 3331

DRILLHOLE RECORD

HOLE No.	KSD100/DHE120
SHEET	1 of 6

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 834316.76 N 820393.61	CONTRACT No. KAW820
MACHINE & No. Longyear L38, D66		DATE from 06/12/02 to 11/12/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 12.46 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
06/12/2002	Sw							INSPECTION PIT 1		0.50			Brown (7.5 YR 4/4) and red (2.5 YR 4/8), slightly clayey slightly silty fine to coarse SAND with occasional angular fine to medium gravel sized quartz and rock fragments (FILL)
								2		1.00			
								3		1.50			
								4		2.00			
			82					5	9.96	2.50			
			100				59blS	S 6	9.46	3.00			Brown (7.5 YR 4/4) and grey (N5/) dappled black, angular COBBLE sized moderately strong to strong granite and concrete fragments with occasional matrix of soft, brown (7.5 YR 4/4), slightly sandy silty CLAY with some angular to subangular fine to coarse gravel sized moderately strong rock fragments (FILL)
								7		3.50			Firm, red (2.5 YR 4/6), sandy silty CLAY with occasional angular fine gravel sized quartz fragments (FILL)
							(1,2, 1,2,3,4) N=10	8 9		4.50			
										4.95			
			100				139blS	10		6.00			
								11		6.50			
										7.50			
							(3,5, 6,7,9,13) N=35	12 13		7.95			
			0				178blS	14		9.00			9.00-9.30m: slightly sandy silty CLAY with some angular to subangular fine to coarse gravel sized moderately strong to strong rock fragments
	Sw 10.00								2.46	9.30 10.00			

- SMALL DISTURBED SAMPLE
- PISTON SAMPLE
- U76 UNDISTURBED SAMPLE
- U100 UNDISTURBED SAMPLE
- MAZIER SAMPLE
- SPT LINER SAMPLE
- WATER SAMPLE
- STANDARD PENETRATION TEST
- IN-SITU VANE SHEAR TEST
- PERMEABILITY TEST
- IMPRESSION PACKER TEST
- PACKER TEST
- PIEZOMETER TIP
- OBSERVATION WELL TIP

LOGGED C.M.Ting

DATE 13/12/2002

CHECKED I.S.McGlen

DATE 14/12/2002

REMARKS

1. Inspection pit excavated to 2.50m depth.
2. Environmental sampling commenced at 10.00m depth, as the site had recently been covered with 9.00m of engineered fill material.
3. Water sample carried out at 10.50m depth when the drillhole was at 10.50m depth.
4. Standpipe installed to 25.00m depth.
5. Temperature Monitoring carried out at 25.00m depth.

Lam Geotechnics Limited

·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel 2882 - 3939 ·Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No.	KSD100/DHE120
SHEET	2 of 6

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 834316.76 N 820393.61	CONTRACT No. KAW820
MACHINE & No. Longyear L38, D66		DATE from 06/12/02 to 11/12/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 12.46 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
	Pw	7.40m 18:00	78				189bls	15		10.50			Very dense, brown (7.5 YR 4/4) and dark grey (7.5 YR 4/1) spotted white, slightly silty fine to coarse SAND with some angular to subrounded fine gravel sized quartz fragments and occasional shell fragments (FILL-derived from Marine Deposit)
		10.08m 08:00						16					
11 07/12/2002			90				240bls	17		11.00			10.00-10.45m: slightly silty clayey SAND with some angular to subrounded fine to coarse gravel sized strong rock fragments
								18		11.50			
12										12.00			
			100				126bls	19		12.50			
13								20		13.00			
			100				74bls	21		13.50			13.50-13.95m: occasional angular fine gravel and cobble sized quartz fragments
14								22		14.00			
							(2,3, 5,11, 17,30) N=63	23		14.50			
15								24		14.95			
			0				172bls	25		15.50			
16			87				95bls	26		16.00			
								27		16.50			
17			100				127bls	28		17.00			
								29		17.50			
18							(1,0, 1,5,10,12) N=29	30		18.00			18.00-18.45m: medium dense
										18.45			
19			0				134bls	31		19.00			
			0				82bls			19.50			
20										20.00			

SMALL DISTURBED SAMPLE	STANDARD PENETRATION TEST
PISTON SAMPLE	IN-SITU VANE SHEAR TEST
U76 UNDISTURBED SAMPLE	PERMEABILITY TEST
U100 UNDISTURBED SAMPLE	IMPRESSION PACKER TEST
MAZIER SAMPLE	PACKER TEST
SPT LINER SAMPLE	PIEZOMETER TIP
WATER SAMPLE	OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 13/12/2002
CHECKED I.S.McGlen
DATE 14/12/2002

REMARKS

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel 2882 - 3939 ·Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No.	KSD100/DHE120
SHEET	3 of 6

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 834316.76 N 820393.61	CONTRACT No. KAW820
MACHINE & No. Longyear L38, D66		DATE from 06/12/02 to 11/12/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 12.46 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
		9.40m 18:00	0				41bls	32					As sheet 2 of 6
09/12/2002 21		10.09m 08:00	0				66bls	33		20.50			20.50-20.95m: some subangular to subrounded coarse gravel and cobble sized moderately strong rock fragments
							(3,6, 10,9, 13,15) N=47	34 35 36		21.00 21.45			
22			18				89bls	37		22.00			
			0				150bls	38 39		22.50 22.72			22.50-22.73m: some subangular to subrounded fine to medium gravel sized quartz and rock fragments
23							(2,4, 6,15, 16,18) N=55	40 41		23.00 23.45			
24			47				169bls	42		24.00			24.00-24.95m: slightly clayey silty SAND with some subangular to subrounded fine to medium gravel sized quartz and rock fragments
			80				62bls	43 44		24.50			
25			89				176bls	45	-12.54	25.00			
							(6,9, 8,8,7,9) N=32	46 47 48		25.50			Dense, strong brown (7.5 YR 5/6), slightly clayey silty fine to coarse SAND with occasional subangular to subrounded fine gravel sized quartz fragments (ALLUVIUM)
26			71				299bls	49 50		25.95 26.00			
			62				97bls	51 52	-14.04	26.50			
27			89				175bls	53 54	-14.54	27.00			Firm, light grey (7.5 YR 7/1) mottled yellow, silty sandy CLAY (ALLUVIUM)
		9.00m 18:00						55	-15.04	27.50			Grey (N5/) mottled yellow, slightly silty fine to coarse SAND (ALLUVIUM)
10/12/2002 28	Pw 28.00 Hw	10.08m 08:00	100				(1,1, 1,2,4,6) N=13	56 57 58		27.95 28.00		V	Extremely weak, yellowish brown and pink mottled white, completely decomposed medium to coarse grained GRANITE (Firm to stiff, slightly sandy silty CLAY with occasional fine gravel sized quartz fragments)
29								59		29.00			
							(2,3, 5,7,9,12) N=33	60 61		29.50 29.95			
30													

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U76 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 13/12/2002
CHECKED I.S.McGlen
DATE 14/12/2002

REMARKS

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 25/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel 2882 - 3939 ·Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No.	KSD100/DHE120
SHEET	4 of 6

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 834316.76 N 820393.61	CONTRACT No. KAW820
MACHINE & No. Longyear L38, D66		DATE from 06/12/02 to 11/12/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 12.46 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
													As sheet 3 of 6
31			100					62	-18.54	31.00		V	Extremely weak, pink and red mottled white and brown, completely decomposed medium to coarse grained GRANITE (Clayey silty fine to coarse SAND with occasional fine gravel sized quartz and granite fragments)
32								63		32.00			
										32.10			
								64		32.50			
33							(2,3, 5,6,9,12) N=32	65		32.95			
34			93					66		34.00			
35								67		35.00			
										35.10			
								68		35.50			
36							(3,5, 14,10, 11,13) N=48	69		35.95			
37			100					70		37.00			
38								71		38.00			
										38.10			
								72		38.50			
39							(5,6, 10,13, 16,21) N=60	73		38.95			
40										40.00			

- SMALL DISTURBED SAMPLE
- PISTON SAMPLE
- U76 UNDISTURBED SAMPLE
- U100 UNDISTURBED SAMPLE
- MAZIER SAMPLE
- SPT LINER SAMPLE
- WATER SAMPLE
- STANDARD PENETRATION TEST
- IN-SITU VANE SHEAR TEST
- PERMEABILITY TEST
- IMPRESSION PACKER TEST
- PACKER TEST
- PIEZOMETER TIP
- OBSERVATION WELL TIP

LOGGED C.M.Ting

DATE 13/12/2002

CHECKED I.S.McGlen

DATE 14/12/2002

REMARKS

Lam Geotechnics Limited

Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.

Laboratory: 25/F., Unit 3, Honour Ind. Centre, No. 6, Sun Yip St., Chaiwan, Hong Kong.

Tel: 2882 - 3939 Fax: 2882 - 3331

DRILLHOLE RECORD

HOLE No. KSD100/DHE120

SHEET 5 of 6

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 834316.76 N 820393.61	CONTRACT No. KAW820
MACHINE & No. Longyear L38, D66		DATE from 06/12/02 to 11/12/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 12.46 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
			90					74					As sheet 4 of 6
41								75		41.00			
										41.10			
								76		41.50			
42							(7,9, 12,15, 24,25) N=76	77		41.95			
		3.10m 18:00											
43										43.00			
	11/12/2002	10.04m 08:00	0										
44								78	-31.64	44.00 44.10			
			0									V/IV	Extremely weak to very weak, reddish brown, completely to highly decomposed medium to coarse grained GRANITE (Slightly sandy fine to medium GRAVEL sized quartz and rock fragments)
45								79	-32.74	45.10 45.20			
							4,13, 63, 100/70mm 163bls/145mm	80 81		45.50		V	Extremely weak, yellowish brown mottled white and black, completely decomposed medium to coarse grained GRANITE (Slightly silty fine to coarse SAND with some fine to medium gravel sized quartz and granite fragments)
46									-33.54	46.00		V/IV	Extremely weak to weak, brown mottled white and black, completely to highly decomposed medium to coarse grained GRANITE (Slightly sandy fine to coarse GRAVEL with occasional cobble sized moderately weak to moderately strong rock fragments)
			0										
	Hw 45.62							82	-34.16	46.52 46.62		III	
47			100	92	27	12.1							
						5.9							Moderately strong, red and reddish grey mottled white and black, moderately decomposed medium to coarse grained GRANITE with closely to medium, occasionally extremely closely to very closely spaced, rough planar and undulating, limonite and manganese oxide stained, chlorite coated, kaolin (<1mm) infilled joints, dipping at 40°-50°, 60°-70°, 70° - 80°, occasionally 0°-10° and 20°-30° 47.10-47.70m: with subvertical joints 47.80-49.80m: moderately strong to strong and moderately to slightly decomposed
48			100	100	100	2.9				47.94		III/II	
			100	100	90					48.58			
49						20.0 1.2							
			100	86	68					49.51			
50						6.7						III	

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U75 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 13/12/2002
CHECKED I.S.McGlen
DATE 14/12/2002

REMARKS

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel: 2882 - 3939 ·Fax: 2882 - 3331

DRILLHOLE RECORD

HOLE No.	KSD100/DHE120
SHEET	6 of 6

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 834316.76 N 820393.61	CONTRACT No. KAW820
MACHINE & No. Longyear L38, D66		DATE from 06/12/02 to 11/12/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 12.46 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
51						2.1						III/II	As sheet 5 of 6 50.40-51.65m: moderately strong to strong and moderately to slightly decomposed
			100	72	41	>20 12.9				50.99			
						2.9							
52		4.95m 18:00				13.3			-39.49	51.95		III	51.75-51.95m: with subvertical joints End of investigation hole at 51.95m
53													
54													
55													
56													
57													
58													
59													
60													

- SMALL DISTURBED SAMPLE
- PISTON SAMPLE
- U76 UNDISTURBED SAMPLE
- U100 UNDISTURBED SAMPLE
- MAZIER SAMPLE
- SPT LINER SAMPLE
- WATER SAMPLE
- STANDARD PENETRATION TEST
- IN-SITU VANE SHEAR TEST
- PERMEABILITY TEST
- IMPRESSION PACKER TEST
- PACKER TEST
- PIEZOMETER TIP
- OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 13/12/2002
CHECKED I.S.McGlen
DATE 14/12/2002

REMARKS

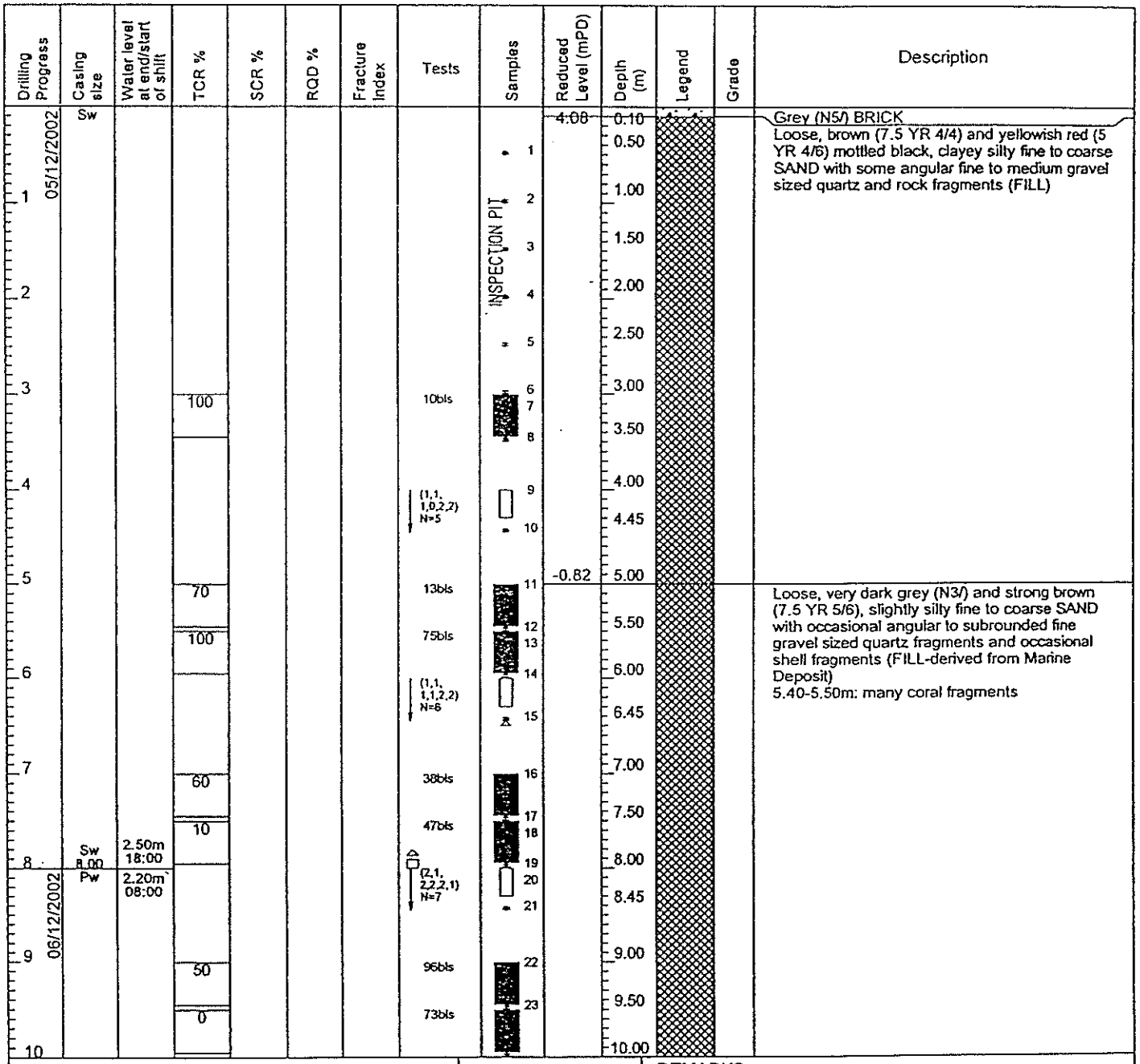
Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel 2882 - 3939 ·Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No.	KSD100/DHEPZ052
SHEET	1 of 4

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 835337.23 N 818060.81	CONTRACT No. KAW820
MACHINE & No. CS15		DATE from 05/12/02 to 09/12/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 4.18 mPD



SMALL DISTURBED SAMPLE
PISTON SAMPLE
U75 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 11/12/2002
CHECKED I.S.McGlen
DATE 13/12/2002

REMARKS
1. Inspection pit excavated to 3.00m depth.
2. Acoustic televiewer carried out at 24.12-30.98m depth.
3. Packer test carried out at 26.75-31.05m depth.
4. Water sample taken at 6.50m depth when the drillhole was at 6.50m depth.
5. Piezometer installed at 17.00m depth.
6. Standpipe installed to 8.00m depth.

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel 2882 - 3939 ·Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No. KSD100/DHEPZ052

SHEET 2 of 4

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 835337.23 N 818060.81	CONTRACT No. KAW820
MACHINE & No. CS15		DATE from 05/12/02 to 09/12/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 4.18 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
11							(5,10, 10,12, 14,14) N=50	24 25 26		10.45			10.00-10.45m: very dense
			90				67bls	27	-6.82	11.00			Black (N2.5/) mottled grey, slightly clayey silty fine to coarse SAND with some subangular to subrounded fine gravel sized quartz fragments and occasional shell fragments (FILL-derived from Marine Deposit)
			100				44bls	28	-7.32	11.50			
12		2.60m 18:00						29 30		12.00			Soft to firm, very dark grey (N3/), slightly silty CLAY with occasional shell fragments (FILL-derived from Marine Deposit)
	07/12/2002	2.30m 08:00	50					31 32	-8.47	12.55 12.65			
13			100				18bls	33		13.15			Greenish grey (10 Y 5/1) mottled white and yellow, clayey silty fine to coarse SAND with occasional angular to subangular fine gravel sized quartz fragments (ALLUVIUM)
			100				67bls	34 35	-9.32	13.50			
	Pw 13.65 Hw		U				100bls	36		13.65 13.73		V	Extremely weak, brown mottled white and black, completely decomposed medium grained GRANITE (Clayey silty fine to coarse SAND with occasional fine gravel sized quartz fragments)
14			100					37 38		13.80			
								39		14.80			
15							(5,6, 8,10, 11,15) N=44	40 41		14.90 15.35			
								42		15.80			
16			100										
								43	-12.72	16.80 16.90			
17							(4,9, 8,10, 10,13) N=41	44 45		17.35		V	Extremely weak, dark brown mottled white and black, completely decomposed medium grained GRANITE (Stiff, clayey sandy SILT with occasional fine gravel sized quartz fragments)
									-13.62	17.80			
18			100					46				V	Extremely weak, brown mottled black and yellow, completely decomposed medium grained GRANITE (Slightly clayey silty fine to coarse SAND with some fine gravel sized quartz and granite fragments)
										18.80 18.90			
19							(5,7, 8,10, 11,14) N=43	47 48 49		19.35			
										19.80			
20								50					

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U76 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 11/12/2002
CHECKED I.S.McGlen
DATE 13/12/2002

REMARKS

Lam Geotechnics Limited
·Office: Z3/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel 2882 - 3939 ·Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No. KSD100/DHEPZ052

SHEET 3 of 4

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 835337.23 N 818060.81	CONTRACT No. KAW820
MACHINE & No. CS15		DATE from 05/12/02 to 09/12/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 4.18 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
			100							20.80			As sheet 2 of 4
21							13.29, 47.83, 70/35mm 200blS/185mm	51 52 53		20.90 21.24			
		2.20m 18:00								21.80			
22		2.10m 08:00	0							22.80			
09/12/2002								54	-18.72	22.90			
23							100/50mm 100blS/50mm	55		22.95		V/IV	Extremely weak to weak, pinkish brown mottled white and black, completely to highly decomposed medium grained GRANITE (Sandy fine to coarse GRAVEL sized very weak to weak rock fragments)
	Hw 23.73								-19.55	23.73		III	Moderately strong, pinkish brown mottled white and brown, moderately decomposed medium grained GRANITE with very closely to closely, occasionally extremely closely spaced, rough planar and undulating, limonite and manganese oxide stained joints, dipping at 0°-10°, 35°-45° and 70°-80°
24			100	82	60	11.8							
						>20							
						13.6				24.66			
25			72	50	50	>20			-20.82	25.00			
						NR			-21.09	25.27		V/IV	24.20-24.35m: with subvertical joints
						>20						III	25.00-25.27m: no recovery inferred to be completely to highly decomposed GRANITE
						1.7			-21.44	25.62			
26			100	90	84							II	Strong, pinkish grey spotted white and black, slightly decomposed medium grained GRANITE with medium to widely, occasionally very closely and closely spaced, rough undulating and smooth planar, limonite, manganese oxide and chlorite stained, kaolin (<1mm) infilled joints, dipping at 5°-15°, 20°-30° and 60°-70°
						13.3							
27			99	99	99	1.2				26.88			26.50-26.75m: with subvertical joints
						10.0							
28						2.0				28.23			
			100	100	100								
29			100	100	100					28.84			
30			100	100	100					29.74			

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U76 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting

DATE 11/12/2002

CHECKED I.S.McGlen

DATE 13/12/2002

REMARKS

Lam Geotechnics Limited

·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel 2882 - 3939 ·Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No. KSD100/DHEPZ052

SHEET 4 of 4

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 835337.23 N 818060.81	CONTRACT No. KAW820
MACHINE & No. CS15		DATE from 05/12/02 to 09/12/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 4.18 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
31		2.30m 18:00				1.3			-26.87	31.05			As sheet 3 of 4 End of investigation hole at 31.05m
32													
33													
34													
35													
36													
37													
38													
39													
40													

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U76 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 11/12/2002
CHECKED I.S.McGlen
DATE 13/12/2002

REMARKS

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel 2882 - 3939 ·Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No. KSD100/DHEPZ113

SHEET 1 of 7

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 834517.83 N 820085.46	CONTRACT No. KAW820
MACHINE & No. LY-38 (CS-4)		DATE from 01/11/02 to 12/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 3.58 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
01/11/2002	Sw							INSPECTION PIT	3.48	0.10			Red (10 R 4/8) BRICK (PAVEMENT)
										0.50			Brown (7.5 YR 4/4), slightly clayey slightly silty fine to coarse SAND with some angular fine to medium gravel sized quartz and rock fragments (FILL)
										1.00			
										1.50			
										2.00			
										2.50			
									0.58	3.00			
			0										Grey (6/) and brown (7.5 YR 4/4), angular coarse GRAVEL and COBBLE sized strong concrete fragments with occasional matrix of brown fine to coarse SAND (FILL)
									-0.52	4.00 4.10			
			0										Very dense, brown (7.5 YR 4/4) mottled white and black, slightly clayey slightly silty fine to coarse SAND with some angular fine to coarse gravel sized quartz and moderately strong to strong granite and concrete fragments and occasional shell fragments (FILL)
										5.00			
		1.40m 18:00					(4,4, 3,3, 40,74) N=120			5.10			
									-2.02	5.55 5.60			
02/11/2002		1.50m 08:00	89										Grey (6/) and pink (7.5 YR 7/3) mottled black, angular COBBLE and BOULDER sized strong granite and granodiorite fragments with some matrix of grey and pink angular fine to coarse GRAVEL sized moderately strong to strong rock fragments with occasional shell fragments (FILL)
									-2.92	6.50			
			75				105bls						Brown (7.5 YR 4/4) and black (7.5 YR 2.5/1) mottled white, sandy angular fine to coarse GRAVEL sized moderately strong to strong rock fragments (FILL)
			0				121bls		-3.42	6.95 7.00			
			67						-3.57	7.15			
									-4.32	7.90 8.00			Brown (7.5 YR 4/4) spotted black, coarse SAND with occasional angular fine gravel sized quartz fragments and occasional shell fragments (FILL)
			0				37bls						
	Sw 8.50 Pw								-4.92	8.45 8.50			Pinkish white (7.5 YR 8/2) mottled brown, angular COBBLE and BOULDER sized moderately strong to strong granite fragments with some matrix of brown mottled grey, slightly sandy clayey silty angular fine to coarse GRAVEL sized moderately strong to strong rock and tile fragments (FILL)
			75				47bls		-5.42	8.95 9.00			
			75				21bls		-5.92	9.45 9.50			
		1.40m 18:00					(2,3, 2,2,3,3) N=10			9.95			7.57-7.90m: strong granite boulder
										10.00			Brown (7.5 YR 4/4), fine to coarse SAND with

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U76 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting

DATE 12/11/2002

CHECKED I.S.McGlen

DATE 13/11/2002

REMARKS

1. Inspection pit excavated to 3.00m depth.
2. Falling head permeability tests carried out at 9.00-10.50m and 28.50-30.00m.
3. Water sample carried out at 8.00m depth.
4. Standpipe installed to 8.00m depth.

Lam Geotechnics Limited

·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel: 2882 - 3939 ·Fax 2882 - 3331

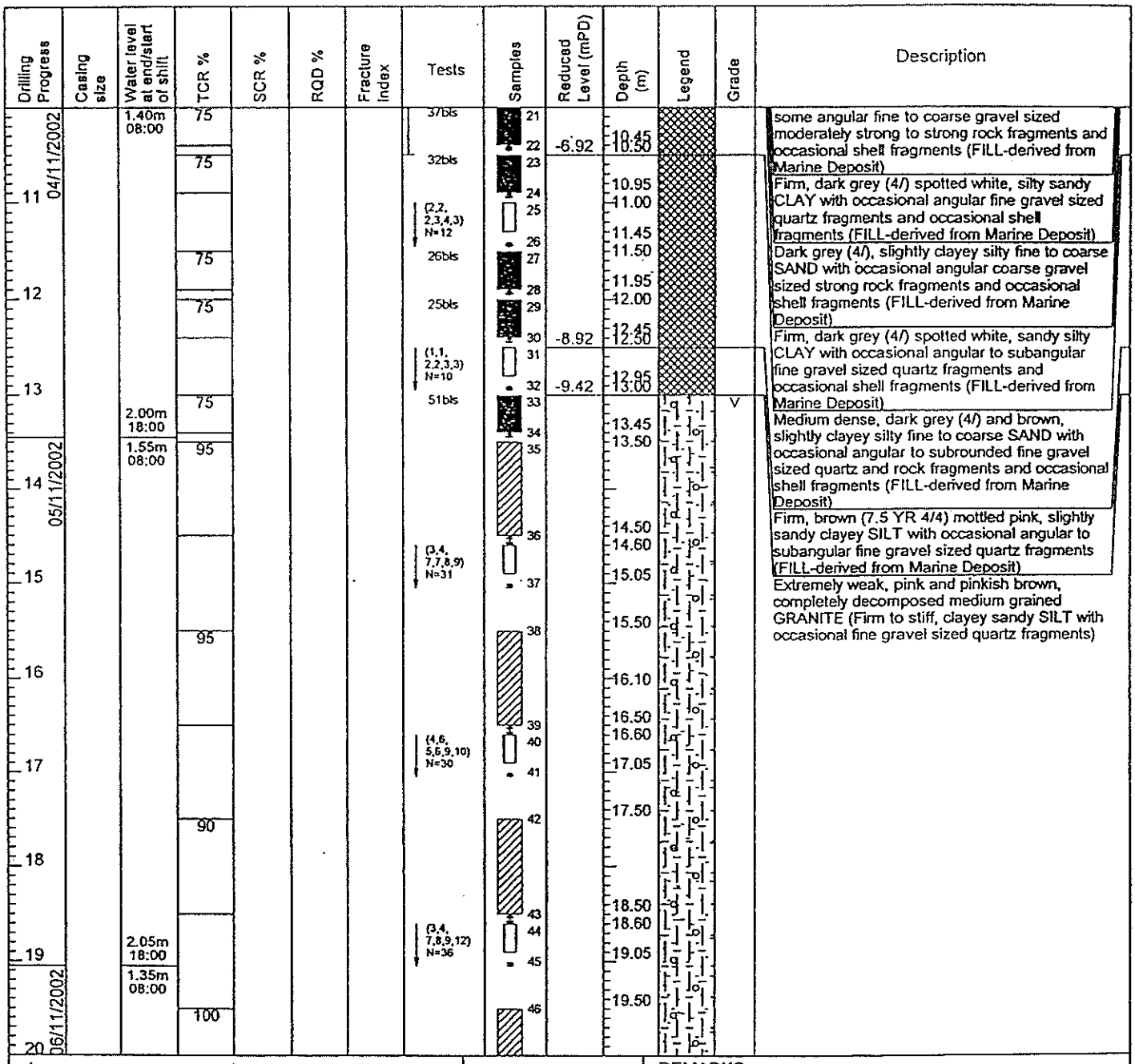
DRILLHOLE RECORD

HOLE No. KSD100/DHEPZ113

SHEET 2 of 7

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 834517.83 N 820085.46	CONTRACT No. KAW820
MACHINE & No. LY-38 (CS-4)		DATE from 01/11/02 to 12/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 3.58 mPD



SMALL DISTURBED SAMPLE
PISTON SAMPLE
U76 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 12/11/2002
CHECKED I.S.McGlen
DATE 13/11/2002

REMARKS

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6, Sun Yip St., Chaiwan, Hong Kong.
·Tel: 2882 - 3939 ·Fax: 2882 - 3331

DRILLHOLE RECORD

HOLE No. KSD100/DHEPZ113

SHEET 3 of 7

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 834517.83 N 820085.46	CONTRACT No. KAW820
MACHINE & No. LY-38 (CS-4)		DATE from 01/11/02 to 12/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 3.58 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
										20.50			As sheet 2 of 7
21							(5,7, 9,12, 13,14) N=48	47 48 49		20.60 21.05			
			100					50	-17.92	21.50		V	Extremely weak, brown and pinkish brown spotted white, completely decomposed medium grained GRANITE (Clayey silty fine to coarse SAND with occasional fine gravel sized quartz fragments)
22										22.50			
							(3,4, 6,10, 12,15) N=43	51 52 53		22.60 23.05			
23										23.50			
			100					54					
24										24.50			
								55 56		24.60			
25							(5,8, 11,14, 17,19) N=61	57		25.05			
			90					58		25.50			
26													
	Pw 26.60 Hw							59		26.50			
27							(7,12, 15,17, 21,22) N=75	60 61		26.60 27.05			
			0							27.50			
28								62		28.50			
								63		28.60 28.80			
29			100										
		2.40m 18:00						64		29.80 29.90 30.00			
30													

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U76 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 12/11/2002
CHECKED I.S.McGlen
DATE 13/11/2002

REMARKS

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel 2882 - 3939 ·Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No. KSD100/DHEPZ113

SHEET 4 of 7

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 834517.83 N 820085.46	CONTRACT No. KAW820
MACHINE & No. LY-38 (CS-4)		DATE from 01/11/02 to 12/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 3.58 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
07/11/2002		1.45m 08:00	90				(11,13, 15,17, 18,22) N=72	65 66 67 68	-28.02	30.45 30.50 31.50 31.60			As sheet 3 of 7
31												V	Extremely weak, brown and pinkish brown mottled black, completely decomposed medium grained GRANITE (Stiff to very stiff, silty sandy CLAY with occasional fine gravel sized quartz fragments)
32							(12,19, 21,23, 28,34) N=106	69 70		32.05 32.50			
33			90					71					
34							(7,13, 19,27, 30,38) N=114	72 73 74		33.50 33.60 34.05 34.50			
35			40					75					
36							(9,16, 17,19, 21,26) N=83	76 77 78		35.50 35.60 36.05			
37		1.80m 18:00	100					79	-32.92	36.50		V	Extremely weak, brown and pinkish brown spotted white and black, completely decomposed medium grained GRANITE (Clayey silty fine to coarse SAND with some fine gravel sized quartz and granite fragments)
38 08/11/2002		1.20m 08:00	100					80 81		37.50 37.60			
39							(9,11, 13,16, 21,27) N=77	82 83 84		38.60 38.70 39.15 39.50			
40			100					85					

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U76 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 12/11/2002
CHECKED I.S.McGlen
DATE 13/11/2002

REMARKS

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel: 2882 - 3939 ·Fax: 2882 - 3331

DRILLHOLE RECORD

HOLE No. KSD100/DHEPZ113

SHEET 5 of 7

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 834517.83 N 820085.46	CONTRACT No. KAW820
MACHINE & No. LY-38 (CS-4)		DATE from 01/11/02 to 12/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 3.58 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
													As sheet 4 of 7
41			90					86 87		40.50 40.60			
42							(11,16, 19,26, 36/42) N=123	88 89 90		41.60 41.70 42.15			
43			90					91		42.50			
44		11.30m 18:00					(15,22, 34,52, 62,83) N=231	92 93 94		43.50 43.60 44.05			
45 09/11/2002		1.20m 08:00	100					95 96	-40.92	44.50		VI/IV	Extremely weak to weak, yellowish brown spotted white and black, completely to highly decomposed medium grained GRANITE (Slightly clayey silty sandy fine to medium GRAVEL sized rock fragments)
46			86	69	54	1.4		TZ101	-42.02	45.20 45.30 45.60		II	Strong to very strong, pinkish grey spotted white and black, slightly decomposed medium grained GRANITE with widely spaced, rough undulating, limonite stained joints, dipping at 5°-15° (CORESTONE)
						6.2			-42.75	46.33		III	
						NI			-43.14	46.72			Weak to moderately strong, light pinkish brown mottled white and black, moderately decomposed medium grained GRANITE with closely spaced, rough undulating, limonite stained joints, dipping at 0°-10° (CORESTONE) 46.72-46.90m: no recovery inferred to be completely to highly decomposed GRANITE
47						NR	50/100 100blS/75mm	97	-43.32	46.90		V/IV	
										47.05		V/IV	
48			80					98	-43.92	47.50		V	Extremely weak to weak, yellowish brown spotted black, completely to highly decomposed medium grained GRANITE (Slightly sandy fine to coarse GRAVEL sized weak rock fragments)
49							23,29, 41,52, 100/70mm 201blS/220mm	99 100 101		48.50 48.60 48.97			Extremely weak, yellowish brown and pinkish brown mottled white and black, completely decomposed medium grained GRANITE (Clayey silty fine to coarse SAND with occasional fine gravel sized quartz fragments)
50			75					102		49.50			

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U76 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 12/11/2002
CHECKED I.S.McGlen
DATE 13/11/2002

REMARKS

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 25/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel: 2882 - 3939 ·Fax: 2882 - 3331

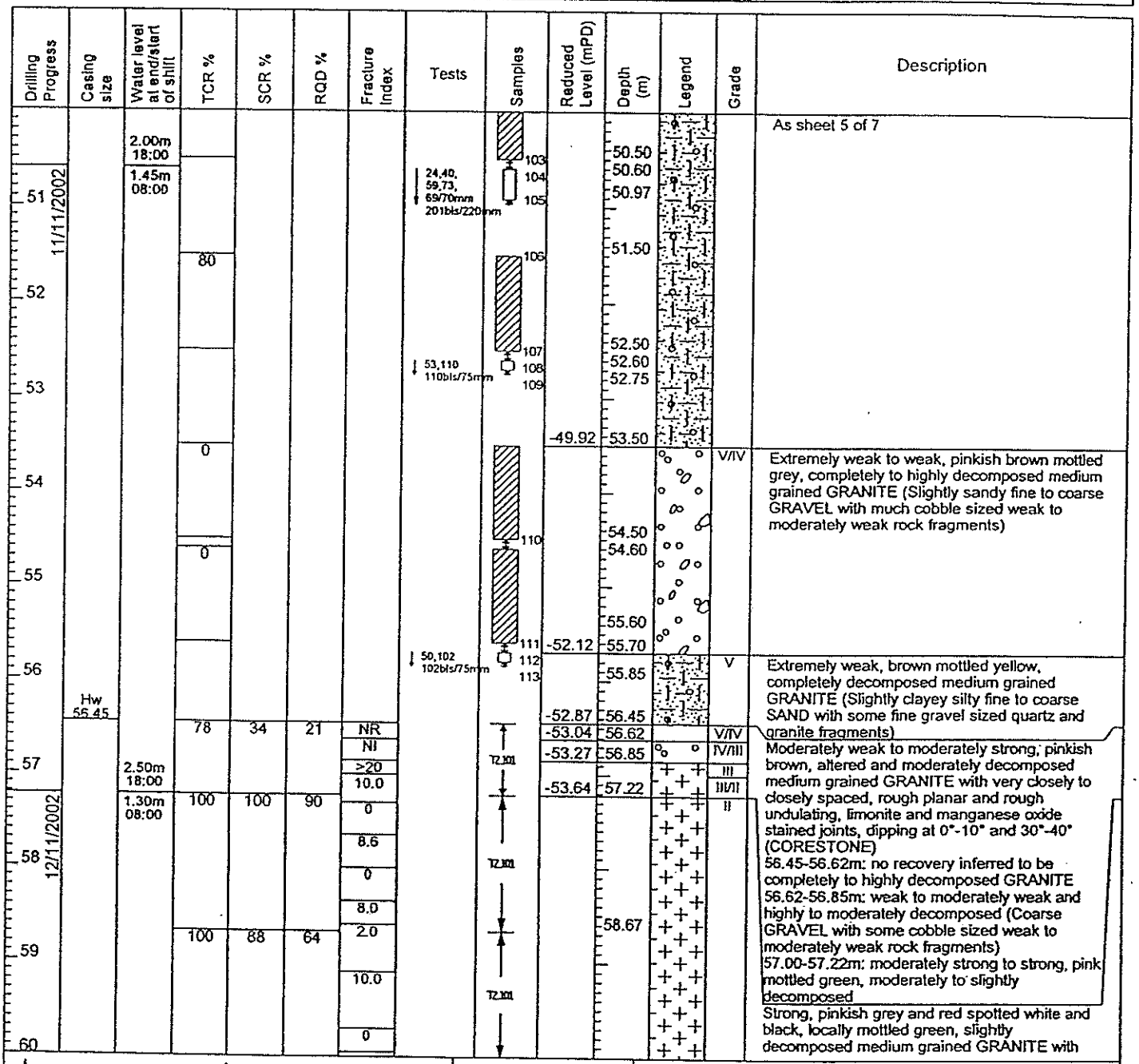
DRILLHOLE RECORD

HOLE No. KSD100/DHEPZ113

SHEET 6 of 7

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 834517.83 N 820085.46	CONTRACT No. KAW820
MACHINE & No. LY-38 (CS-4)		DATE from 01/11/02 to 12/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 3.58 mPD



SMALL DISTURBED SAMPLE
PISTON SAMPLE
U76 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting

DATE 12/11/2002

CHECKED I.S.McGlen

DATE 13/11/2002

REMARKS

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 26/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel 2882 - 3939 ·Fax 2882 - 3331

DRILLHOLE RECORD

HOLE No. KSD100/DHEPZ113

SHEET 7 of 7

PROJECT Kowloon - Canton Railway Corporation Ground Investigation (Stage 1) of Kowloon Southern Link

METHOD IP+W+RC	CO-ORDINATES E 834517.83 N 820085.46	CONTRACT No. KAW820
MACHINE & No. LY-38 (CS-4)		DATE from 01/11/02 to 12/11/02
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL 3.58 mPD

Drilling Progress	Casing size	Water level at end/start of shift	TCR %	SCR %	RQD %	Fracture Index	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
61			100	100	38	>20 8.6 13.8		T2.00m T2.00m		60.18			closely to medium, occasionally extremely closely and very closely spaced, rough and smooth planar, limonite and chlorite stained, kaolin (<1mm) infilled joints, dipping at 30°-40° and 60°-70° 57.22-58.00m: altered
62		3.80m 18:00	100	94	68	2.9 20.0 5.7		T2.00m	-59.12	61.60 62.70		III II	61.90-62.50m: moderately strong, red, moderately decomposed
63													End of investigation hole at 62.70m
64													
65													
66													
67													
68													
69													
70													

SMALL DISTURBED SAMPLE
PISTON SAMPLE
U75 UNDISTURBED SAMPLE
U100 UNDISTURBED SAMPLE
MAZIER SAMPLE
SPT LINER SAMPLE
WATER SAMPLE
STANDARD PENETRATION TEST
IN-SITU VANE SHEAR TEST
PERMEABILITY TEST
IMPRESSION PACKER TEST
PACKER TEST
PIEZOMETER TIP
OBSERVATION WELL TIP

LOGGED C.M.Ting
DATE 12/11/2002
CHECKED I.S.McGlen
DATE 13/11/2002

REMARKS

Lam Geotechnics Limited
·Office: 23/F World Trade Centre, 280 Gloucester Rd., Causeway Bay, Hong Kong.
·Laboratory: 2S/F., Unit 3, Honour Ind. Centre, No. 6. Sun Yip St., Chaiwan, Hong Kong.
·Tel 2882 - 3939 ·Fax 2882 - 3331

ANNEX 2

ANALYTICAL RESULTS OF SOIL SAMPLES

Project : KSL GSA 5100 Environmental Impact Assessment & Associated Services

Title : Land Contamination Assessment

Analytical results of soil samples

Analyte Description	Limits of Reporting	Dutch List			Drillhole Reference																		
					KSD100/DHEPZ052								KSD100/DHE056			KSD100/DH063							
	Soil (mg/kg dry soil)	Soil (mg/kg dry soil)			Sampling Date and Depth (m)								Sampling Date and Depth (m)			Sampling Date and Depth (m)							
		A	B	C	02-Dec-02 0.5m	02-Dec-02 1.5m	02-Dec-02 3.0m	05-Dec-02 5-5.5m	05-Dec-02 7-7.5m	05-Dec-02 9-9.5m	06-Dec-02 11-11.5m	06-Dec-02 11.50-12m	04-Nov-02 0.5m	04-Nov-02 1.5m	04-Nov-02 3.0m	23-Nov-02 0.5m	23-Nov-02 1.5m	23-Nov-02 3.0m	25-Nov-02 4.50-4.95m	26-Nov-02 6.5-6.95m	26-Nov-02 8.5-8.95m	26-Nov-02 10.5-10.95m	26-Nov-02 12.5-12.95m	26-Nov-02 14.5-14.95m
Metals																TCLP							
Cadmium (Cd)	0.02	1	5	20	0.5	0.2	0.4	0.1	0.2	0.1	0.2	0.5	<0.02	<0.02	0.02	0.4	0.5	0.04	0.04	0.06	0.04	0.03	0.1	0.1
Chromium (Cr)	0.1	100	250	800	2.3	1.5	0.7	4.2	6.7	13	3.7	8.9	0.4	0.9	0.9	2.9	1.3	0.8	2.7	1.8	3.4	2.4	7.6	0.4
Copper (Cu)	0.1	50	100	500	6.2	2.8	0.9	1.5	1.9	6.4	1.5	3.7	0.7	1.4	1.4	7.4	8.7	2	6.4	23	2.7	2.5	3.6	1.2
Nickel (Ni)	0.05	50	100	500	1.3	0.4	4.0	2.3	1.4	3.9	1.2	3.9	0.3	0.3	0.7	2.7	1.2	0.7	2.5	0.8	2.4	0.9	1.9	0.2
Lead (Pb)	0.1	50	150	600	93	39	43	6.4	8.5	4.0	7.7	29	39	30	140	120	220	43	6.3	18	4.6	2.6	12	16
Zinc (Zn)	6	200	500	3000	56	28	29	170	64	89	58	45	8.4	10	18	51	79	38	100	83	35	27	200	46
Mercury (Hg)	0.1	0.5	2	10	0.5	0.5	0.3	0.2	0.2	0.3	0.1	0.4	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic (As)	0.1	20	30	50	1.5	2.1	<0.1	0.6	2.2	0.4	1.7	4.3	0.5	0.7	1.5	3.0	2.0	1.2	0.7	1.1	1.0	0.9	2.7	1.1
Barium (Ba)	0.1	200	400	2000	75	51	28	5.4	6.4	3.1	2.1	6.8	4.6	20	41	53	84	150	27	21	3.6	1.4	4.3	21
Cobalt (Co)	0.1	20	50	300	4.1	3.3	2.6	1.2	1.0	0.6	0.6	2.0	0.5	1.3	5.5	3.7	3.4	3.5	1.5	4.6	0.8	0.2	1.1	4.8
Molybdenum (Mo)	0.1	10	40	200	1.3	1.1	0.6	0.2	0.4	2.0	9.5	3.2	1.8	0.6	4.9	1.7	2.3	0.7	0.5	0.4	0.5	1.1	7.5	0.3
Tin (Sn)	5	20	50	300	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPH																								
C6 – C9	2	20	100	800	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
C10 – C14	50				< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
C15 – C28	100	100	1000	5000	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	246	234	131	< 100	210	< 100	< 100	< 100	< 100	145	< 100
C29 – C36	100				< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	118	167	< 100	< 100	130	< 100	< 100	< 100	< 100	120	< 100
BTEX																								
Benzene	0.2	0.01	0.5	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Ethylbenzene	0.2	0.05	5	50	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Toluene	0.2	0.05	3	30	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Meta - & Para Xylene	0.4	0.05	5	50	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Ortho Xylene	0.2				< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Cyanide																								
Total Cyanide	1	5	50	500	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Sulphates																								
Sulphate (acid soluble)	0.01%	--	--	--	0.1	< 0.01	< 0.01	0.02	0.07	0.02	0.76	0.96	0.02	0.02	0.04	0.06	< 0.01	0.06	0.03	0.10	0.02	0.10	0.16	0.03

[1] Drillhole KSD100/DHE120 is located at the existing Nam Cheong Park. This Park was constructed after the site formation for West Kowloon and the top 10m depth of fill materials were brought in recently by the West Rail Project. Since reclamation, there is no change o It is therefore considered that the top 10m of soil at Drillhole KSD100/DHE120 is not contaminated and this layer of soil is also considered to be free from any potential contamination from the previous shipyard operations as stated in the CAP

[2] As the lowest level of the rail tunnels at this section will be approximately 16-17mbgl, the results underneath the bottom of the tunnels would not be relevant to this project

\# As dioxins is not included in the Dutch List, USEPA criteria (ie 1ppb) is adopted

220 The testing result exceeded Dutch B Levels

TCLP The soil samples selected for TCLP testing

Project : KSL GSA 5100 Environmental Impact Assessment & Associated Services
Title : Land Contamination Assessment
Analytical results of soil samples

Analyte Description	Limits of Reporting	Dutch List			Drillhole Reference																
					KSD100/DHEPZ052								KSD100/DHE056			KSD100/DH063					
	Soil (mg/kg dry soil)	Soil (mg/kg dry soil)			Sampling Date and Depth (m)								Sampling Date and Depth (m)			Sampling Date and Depth (m)					
		A	B	C	02-Dec-02 0.5m	02-Dec-02 1.5m	02-Dec-02 3.0m	05-Dec-02 5-5.5m	05-Dec-02 7-7.5m	06-Dec-02 9-9.5m	06-Dec-02 11-11.5m	06-Dec-02 11.50-12m	06-Nov-02 0.5m	06-Nov-02 1.5m	06-Nov-02 3.0m	23-Nov-02 0.5m	23-Nov-02 1.5m	23-Nov-02 3.0m	25-Nov-02 4.50-4.95m	26-Nov-02 6.5-6.95m	26-Nov-02 8.5-8.95m	26-Nov-02 10.5-10.95m	26-Nov-02 12.5-12.95m	26-Nov-02 14.5-14.95m
PAHs																					
Naphthalene (NAP)	0.05	0.1	5	10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	0.11	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphtylene (ANY)	0.05	--	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphtene (ANA)	0.05	--	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluorene (FLU)	0.05	--	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phenanthrene (PHE)	0.05	--	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	1.5	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Anthracene (ANT)	0.05	0.1	10	100	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	0.21	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chrysene (CHR)	0.05	--	--	--	0.10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	1.5	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)anthracene (BaA)	0.05	--	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	1.7	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(b)fluoranthene (BbF)	0.05	--	--	--	0.11	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	3.1	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene (BkF)	0.05	--	--	--	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	1.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene (BaP)	0.05	--	--	--	0.11	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	2.6	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenz(ah)anthracene (DBA)	0.05	--	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	0.42	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluoranthene (FLT)	0.05	0.1	10	100	0.12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	3.1	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-cd)pyrene (IPY)	0.05	--	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	0.57	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Pyrene (PYR)	0.05	0.1	10	100	0.18	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	2.3	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(ghi)perylene (BPE)	0.05	--	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	1.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total PAHs	--	1	20	200	<1.2	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<19.49	<0.97	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
Dioxins																					
PCDD & PCDF# (in ppb)	--	--	--	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.42	0.39	0.0083	0.065	0.62	0.21	0.0089	0.27	0.059

[1] Drillhole KSD100/DHE120 is located at the existing Nam Cheong Park. This Park was constructed after the site formation for West Kowloon and the top 10m depth of fill materials were brought in recently by the West Rail Project. Since reclamation, there is no change o
It is therefore considered that the top 10m of soil at Drillhole KSD100/DHE120 is not contaminated and this layer of soil is also considered to be free from any potential contamination from the previous shipyard operations as stated in the CAP.

[2] As the lowest level of the rail tunnels at this section will be approximately 16-17mbgl, the results underneath the bottom of the tunnels would not be relevant to this project.

As dioxins is not included in the Dutch List, USEPA criteria (ie. 1ppb) is adopted.

220 The testing result exceeded Dutch B Levels.

TCLP The soil samples selected for TCLP testing.

Project : KSL GSA 5100 Environmental Impact Assessment & Associated Services

Title : Land Contamination Assessment

Analytical results of soil samples

Analyte Description	Limits of Reporting	Dutch List			KSD100/DHEPZ113								Drillhole Reference KSD100/DH120				
	Soil (mg/kg dry soil)	oil (mg/kg dry soil			Sampling Date and Depth (m)								Sampling Date and Depth (m)				
		A	B	C	31-Oct-02 0.5m	31-Oct-02 1.5m	01-Nov-02 3.0m	02-Nov-02 6.50-6.95m	02-Nov-02 8.50-8.95m	04-Nov-02 0.00-10.45m	04-Nov-02 1.50-11.95m	04-Nov-02 13.00-13.45m	06-Dec-02 10.00-10.45m [1]	07-Dec-02 11.00-11.45m	07-Dec-02 12.5-12.95m	07-Dec-02 16-16.45m	08-Dec-02 22-22.45m [2]
Metals																	
Cadmium (Cd)	0.02	1	5	20	0.04	0.03	0.03	0.05	0.03	0.1	0.05	0.03	0.1	0.1	0.1	0.1	0.1
Chromium (Cr)	0.1	100	250	800	4.9	4	5.1	3.1	8.7	12	7	1.1	3.0	4.3	3.3	5.4	4.2
Copper (Cu)	0.1	50	100	500	5.0	3.5	4.2	7.3	2.6	4.7	2	1	1.5	3.7	1.8	3.4	1.1
Nickel (Ni)	0.05	50	100	500	3.6	4.4	3.7	2.9	6.4	8.3	3.8	0.8	1.5	2.7	1.8	3.2	1.8
Lead (Pb)	0.1	50	150	600	8.6	5	4.5	7.2	9	12	12	10	3.7	3.4	3.6	4.2	2.4
Zinc (Zn)	6	200	500	3000	19	18	22	110	110	72	75	81	24	40	19	21	12
Mercury (Hg)	0.1	0.5	2	10	<0.1	0.10	0.20	0.20	<0.1	0.1	0.2	0.6	0.2	0.3	0.3	0.2	0.3
Arsenic (As)	0.1	20	30	50	2.8	1.8	1.8	0.8	1.3	2.9	2.2	0.2	1.8	1.7	1.2	1.3	1.8
Barium (Ba)	0.1	200	400	2000	8.9	5	5.6	18	14	15	22	83	4.9	89	2.5	4.3	1.5
Cobalt (Co)	0.1	20	50	300	1.9	1.6	1.9	1.1	2.9	3.8	2.4	2.2	1.1	1.3	1.2	1.7	1
Molybdenum (Mo)	0.1	10	40	200	0.4	0.1	0.5	0.8	0.3	1.8	0.4	0.2	0.3	0.8	0.4	0.6	0.2
Tin (Sn)	5	20	50	300	<5	<5	<5	6.4	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPH																	
C6 – C9	2	20	100	800	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
C10 – C14	50				< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
C15 – C28	100	100	1000	5000	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
C29 – C36	100				< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
BTEX																	
Benzene	0.2	0.01	0.5	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Ethylbenzene	0.2	0.05	5	50	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Toluene	0.2	0.05	3	30	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Meta - & Para Xylene	0.4	0.05	5	50	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Ortho Xylene	0.2				< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Cyanide																	
Total Cyanide	1	5	50	500	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Sulphates																	
Sulphate (acid soluble)	0.01%	--	--	--	0.03	0.02	< 0.01	0.13	0.31	0.28	0.28	0.07	0.02	0.12	< 0.01	0.02	0.03

[1] Drillhole KSD100/DHE120 is located at the existing Nam Cheong Park. This Park was constructed after the site formation for West Kowloon and the top 10m depth of fill materials were brought in recently by the West Rail Project. Since reclamation, there is no change of land. It is therefore considered that the top 10m of soil at Drillhole KSD100/DHE120 is not contaminated and this layer of soil is also considered to be free from any potential contamination from the previous shipyard operations as stated in the CAP.

[2] As the lowest level of the rail tunnels at this section will be approximately 16-17mbgl, the results underneath the bottom of the tunnels would not be relevant to this project.

As dioxins is not included in the Dutch List, USEPA criteria (ie. 1ppb) is adopted.

220 The testing result exceeded Dutch B Levels

TCLP The soil samples selected for TCLP testing

Project : KSL GSA 5100 Environmental Impact Assessment & Associated Services

Title : Land Contamination Assessment

Analytical results of soil samples

Analyte Description	Limits of Reporting	Dutch List			KSD100/DHEPZ113								Drillhole Reference KSD100/DH120				
	Soil (mg/kg dry soil)	oil (mg/kg dry soil			Sampling Date and Depth (m)								Sampling Date and Depth (m)				
		A	B	C	31-Oct-02 0 5m	31-Oct-02 1 5m	01-Nov-02 3 0m	02-Nov-02 6 50-6 95m	02-Nov-02 8 50-8 95m	04-Nov-02 0 00-10 45m	04-Nov-02 1 50-11 95m	04-Nov-02 13 00-13 45m	06 Dec-02 10 00-10 45m[1]	07-Dec-02 11 00-11 45m	07-Dec-02 12 5-12 95m	07-Dec-02 16-16 45m	09-Dec-02 22-22 45m[2]
PAHs																	
Naphthalene (NAP)	0 05	0 1	5	10	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Acenaphtylene (ANY)	0 05	--	--	--	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Acenaphtene (ANA)	0 05	--	--	--	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Fluorene (FLU)	0 05	--	--	--	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Phenanthrene (PHE)	0 05	--	--	--	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Anthracene (ANT)	0 05	0 1	10	100	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Chrysene (CHR)	0 05	--	--	--	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Benzo(a)anthracene (BaA)	0 05	--	--	--	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Benzo(b)fluoranthene (BbF)	0 05	--	--	--	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Benzo(k)fluoranthene (BkF)	0 05	--	--	--	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Benzo(a)pyrene (BaP)	0 05	--	--	--	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Dibenz(ah)anthracene (DBA)	0 05	--	--	--	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Fluoranthene (FLT)	0 05	0 1	10	100	< 0 05	< 0 05	< 0 05	0 14	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Indeno(1,2,3-cd)pyrene (IPY)	0 05	--	--	--	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Pyrene (PYR)	0 05	0 1	10	100	< 0 05	< 0 05	< 0 05	0 41	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Benzo(ghi)perylene (BPE)	0 05	--	--	--	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	< 0 05	<0 05	<0 05	<0 05	<0 05	<0 05
Total PAHs	--	1	20	200	<0 7	<0 7	<0 7	<1 15	<0 7	<0 7	<0 7	<0 7	<0 7	<0 7	<0 7	<0 7	<0 7
Dioxins																	
PCDD & PCDF# (in ppb)	--	--	--	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 14	0 29	0 022	0 21	0 021

[1] Drillhole KSD100/DHE120 is located at the existing Nam Cheong Park This Park was constructed after the site formation for West Kowloon and the top 10m depth of fill materials were brought in recently by the West Rail Project Since reclamation there is no change of land It is therefore considered that the top 10m of soil at Drillhole KSD100/DHE120 is not contaminated and this layer of soil is also considered to be free from any potential contamination from the previous shipyard operations as stated in the CAP

[2] As the lowest level of the rail tunnels at this section will be approximately 16-17mbgl, the results underneath the bottom of the tunnels would not be relevant to this project

As dioxins is not included in the Dutch List, USEPA criteria (ie 1ppb) is adopted

220 The testing result exceeded Dutch B Levels

TCLP The soil samples selected for TCLP testing

Project : KSL GSA 5100 Environmental Impact Assessment & Associated Services
Title : Land COntamination Assessment
Analytical results of heavy metals after TCLP extraction

Analyte Description	Limits of Reporting	Landfill Disposal Criteria	Drillhole Reference												
			KSD100/DHEPZ113								KSD100/DH120				
	mg/L	mg/L (ppm)	Sampling Date and Depth (m)								Sampling Date and Depth (m)				
			31-Oct-02 0 5m	31-Oct-02 1 5m	01-Nov-02 3 0m	02-Nov-02 6 50-6 95m	02-Nov-02 8 50-8 95m	04-Nov-02 10 00-10 45m	04-Nov-02 11 50-11 95m	04-Nov-02 13 00-13 45m	06-Dec-02 10 00-10 45m	07-Dec-02 11 00-11 45m	07-Dec-02 12 5-12 95m	07-Dec-02 16-16 45m	09-Dec-02 22-22 45m
TCLP (Metals)															
Cadmium (Cd)	1	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chromium (Cr)	1	50	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Copper (Cu)	2	250	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Nickel (Ni)	1 5	250	< 1 5	< 1 5	< 1 5	< 1 5	< 1 5	< 1 5	< 1 5	< 1 5	< 1 5	< 1 5	< 1 5	< 1 5	< 1 5
Lead (Pb)	3	50	< 3	<3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Zinc (Zn)	10	250	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury (Hg)	1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aresnic (As)	2 5	50	< 2 5	< 2 5	< 2 5	< 2 5	< 2 5	< 2 5	< 2 5	< 2 5	< 2 5	< 2 5	< 2 5	< 2 5	< 2 5
Barium (Ba)	2	1000	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Beryllium (Be)	1	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Selenium (Se)	1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Thallium (Tl)	0 08	50	< 0 08	< 0 08	< 0 08	< 0 08	< 0 08	< 0 08	< 0 08	< 0 08	< 0 08	< 0 08	< 0 08	< 0 08	< 0 08
Vanadium (V)	4	250	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4
Antimony (Sb)	2	150	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Tin (Sn)	2	250	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Silver (Ag)	2	50	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Project : KSL GSA 5100 Environmental Impact Assessment & Associated Services
Title : Land COntamination Assessment
Analytical results of heavy metals after TCLP extraction

Analyte Description	Limits of Reporting	Landfill Disposal Criteria	Drillhole Reference																		
			KSD100/DHEPZ052								KSD100/DHE056			KSD100/DH063							
	mg/L	mg/L (ppm)	Sampling Date and Depth (m)								Sampling Date and Depth (m)			Sampling Date and Depth (m)							
			02-Dec-02 0.5m	02-Dec-02 1.5m	02-Dec-02 3.0m	05-Dec-02 5-5.5m	05-Dec-02 7-7.5m	06-Dec-02 9-9.5m	06-Dec-02 11-11.5m	06-Dec-02 11.50-12m	06-Nov-02 0.5m	06-Nov-02 1.5m	06-Nov-02 3.0m	23-Nov-02 0.5m	23-Nov-02 1.5m	23-Nov-02 3.0m	25-Nov-02 4.50-4.95m	26-Nov-02 6.5-6.95m	26-Nov-02 8.5-8.95m	26-Nov-02 10.5-10.95m	26-Nov-02 12.5-12.95m	26-Nov-02 14.5-14.95m
TCLP (Metals)																					
Cadmium (Cd)	1	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chromium (Cr)	1	50	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Copper (Cu)	2	250	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Nickel (Ni)	1.5	250	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Lead (Pb)	3	50	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	12	< 3	< 3	< 3	< 3	< 3	< 3
Zinc (Zn)	10	250	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury (Hg)	1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aresnic (As)	2.5	50	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Barium (Ba)	2	1000	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Beryllium (Be)	1	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Selenium (Se)	1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Thallium (Tl)	0.08	50	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08
Vanadium (V)	4	250	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4
Antimony (Sb)	2	150	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Tin (Sn)	2	250	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Silver (Ag)	2	50	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

ANNEX 3

ANALYTICAL RESULTS OF GROUNDWATER SAMPLES

Project : KSL GSA 5100 Environmental Impact Assessment & Associated Services
Title : Land Contamination Assessment
Analytical results of water samples

Analyte Description	Limits of Reporting	Dutch List			Analyte Description				
					KSD100/DHEPZ052	KSD100/DHE053	KSD100/DH063	KSD100/DHEPZ113	KSD100/DH120
	ug/L	Ground water (ug/L)			Sampling Date and Depth (m)	Sampling Date and Depth (m)	Sampling Date and Depth (m)	Sampling Date and Depth (m)	Sampling Date and Depth (m)
		A	B	C	24-Feb-03 8.0m	25-Feb-03 6 5m	26-Nov-02 3 0m	24-Feb-03 6 5m	28-Feb-03 10 96m
pH & temp									
pH Value	--	--	--	--	8	7 2	7 89	7 40	7 7
Temperature	--	--	--	--	20.4	19 8	22 4	19 1	26 9
Metals									
Cadmium (Cd)	0.02	1	2.5	10	1.3	<0.2	<0 2	0 5	0 5
Chromium (Cr)	0.1	20	50	200	43	7 1	6	51	4 7
Copper (Cu)	0.1	20	50	200	230	340	400	330	55
Nickel (Ni)	0.05	20	50	200	23	5.7	3 5	27	8 1
Lead (Pb)	0.1	20	50	200	210	5.1	13	210	61
Zinc (Zn)	6	50	200	800	270	53	130	290	37
Mercury (Hg)	0.1	0.2	0.5	2	1.6	2.5	<0 5	2.9	<0 5
Arsenic (As)	0.1	10	30	100	21	<10	<10	15	<10
Barium (Ba)	0.1	50	100	500	350	110	130	350	120
Cobalt (Co)	0.1	20	50	200	16	4.8	4 5	17	<1
Molybdenum (Mo)	0.1	5	20	100	19	26	15	17	7 9
Tin (Sn)	5	10	30	150	124	7 4	5 3	74	11
TPH									
C6 – C9	20	10	40	150	<20	<20	<20	<20	<20
C10 – C14	50	20	200	600	<50	<50	<50	<50	<50
C15 – C28	100				<100	<100	115	130	321
C29 – C36	50				<50	110	<50	<50	<50
BTEX									
Benzene	2	0.2	1	5	<2	<2	<2	<2	<2
Ethylbenzene	2	0.5	20	60	<2	<2	<2	<2	<2
Toluene	2	0.5	15	50	<2	<2	<2	<2	<2
Meta - & Para Xylene	4	0.5	20	60	<4	<4	<4	<4	<4
Ortho Xylene	2				<2	<2	<2	<2	<2
Cyanide									
Total Cyanide	0.05mg/L	10	50	200	<0 05	<0.05	<0 05	<0 05	<0 05
Sulphates									
SO4	5mg/L	--	--	--	640	1400	1600	830	360

Project : KSL GSA 5100 Environmental Impact Assessment & Associated Services
Title : Land Contamination Assessment
Analytical results of water samples

Analyte Description	Limits of Reporting	Dutch List			Analyte Description				
					KSD100/DHEPZ052	KSD100/DHE053	KSD100/DH063	KSD100/DHEPZ113	KSD100/DH120
	ug/L	Ground water (ug/L)			Sampling Date and Depth (m)	Sampling Date and Depth (m)	Sampling Date and Depth (m)	Sampling Date and Depth (m)	Sampling Date and Depth (m)
		A	B	C	24-Feb-03 8.0m	25-Feb-03 6.5m	26-Nov-02 3.0m	24-Feb-03 6.5m	28-Feb-03 10.96m
PAHs									
Acenaphtylene (ANY)	0.5	0.2	7	30	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphtene (ANA)	0.5	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene (FLU)	0.5	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene (PHE)	0.5	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene (ANT)	0.5	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene (CHR)	0.5	0.1	2	10	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)anthracene (BaA)	0.5	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene (BbF)	0.5	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene (BkF)	0.5	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene (BaP)	0.5	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(ah)anthracene (DBA)	0.5	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene (FLT)	0.5	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1,2,3-cd)pyrene (IPY)	0.5	0.02	1	5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene (PYR)	0.5	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(ghi)perylene (BPE)	0.5	0.02	1	5	<0.5	<0.5	<0.5	<0.5	<0.5
BPE	0.5	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5
Total PAHs	--	0.2	10	40	<8	<8	<8	<8	<8
Dioxins									
PCDD & PCDF# (in ppb)	--	--	--	--	N/A	N/A	0.04	N/A	0.019

\# : As dioxins is not included in the Dutch List, USEPA criteria (ie. 1ppb) is adopted

200 : The testing results exceeded Dutch C Levels

ANNEX 4

CHRONIC ORAL REFERENCE DOSES (RfD_o) AND CARCINOGENIC SLOPE FACTOR (SF_o)

Chronic Oral Reference Doses (RfD_o) for Non-carcinogens

Data on Chronic Oral Reference Doses (RfD_o) for the respective non-carcinogens has been collected from the USEPA Integrated Risk Information System (IRIS) and Office of Environmental Health Hazard Assessment (OEHHA). They are discussed below:

Copper

The RfD_o for copper is not available from IRIS and OEHHA at this moment, therefore, the reference dose for copper cyanide (0.005 mg/kg/day) is adopted.

Mercury

Reference doses are quoted for elemental mercury, mercuric chloride and methylmercury. The low concentrations of mercury found in groundwater are expected to be found in the dissolved phase as and therefore the reference dose for mercuric chloride ($HgCl_2$) is likely to be the most applicable. However, the reference dose for methylmercury (MeHg) is lower than that for mercuric chloride. Since there is a small possibility that the mercury is present in a methylated form, this lower value has been adopted as a conservative assumption.

Carcinogenic Slope Factor – Oral (SF_o)

Lead

Lead is classified as a "Probable Human Carcinogen" under USEPA's classification. However in IRIS, a screening-level review of Lead is on-going and no data for Lead is provided. The SF_o of Lead can be found in the Office of Environmental Health Hazard Assessment (OEHHA). 3 SF_o for lead are quoted in OEHHA, they are for lead acetate, lead & lead compounds and lead subacetate, respectively. For conservative risk assessment, SF_o for lead acetate ($0.28(mg/kg\text{-}day)^{-1}$) has therefore adopted.